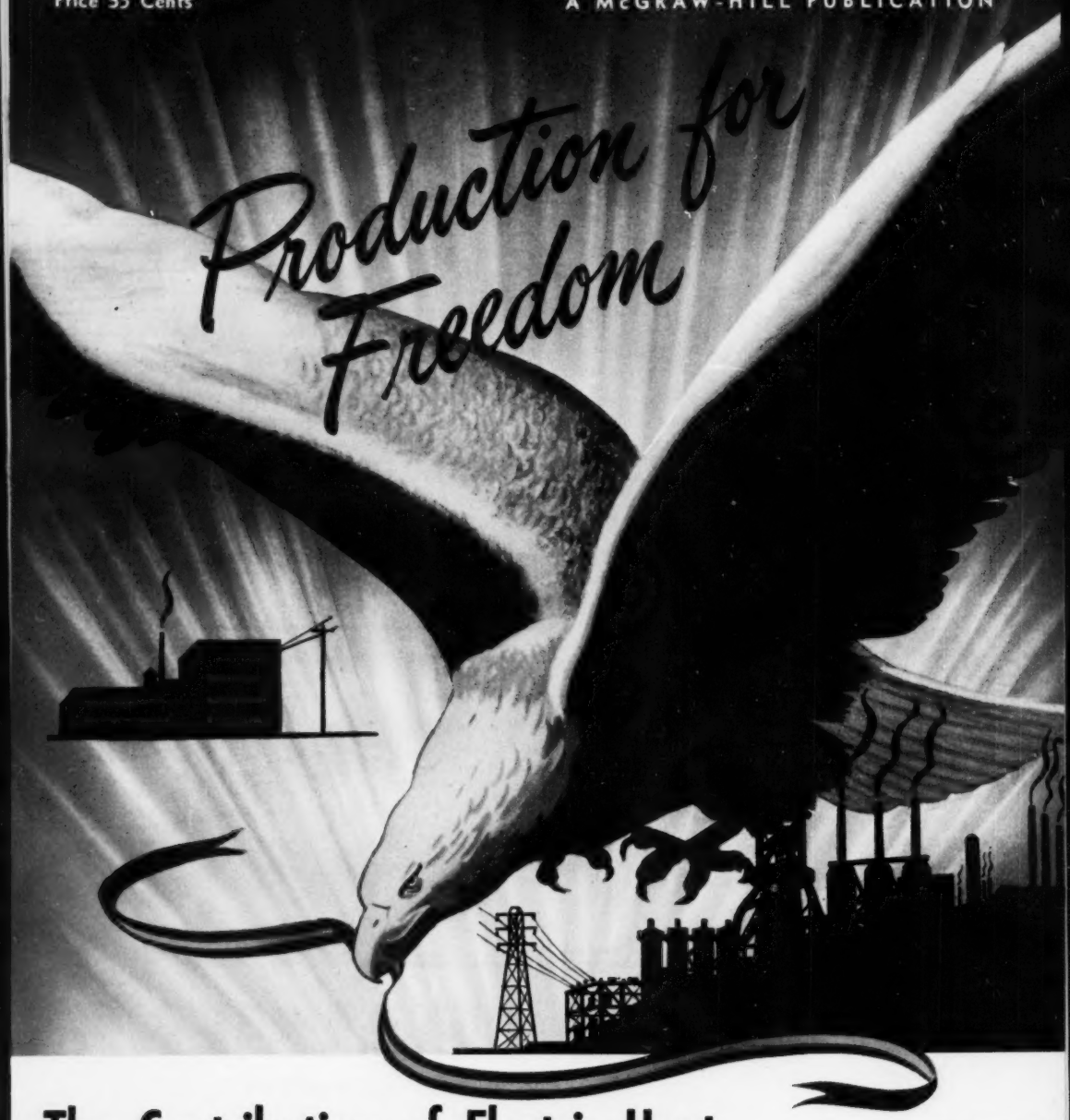
SEPTEMBER 8, 1952

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



The Contribution of Electric Heat

SEE PAGE 103

ALLIS-CHALMERS
5/8% Step Voltage Regulators

...GET MORE PROFITS FROM ALL YOUR FEEDERS

You can make your feeders pay off in more profits easily: just add Allis-Chalmers distribution regulators to your lines. The cost is low. In fact, in many cases increased profits cover equipment costs in less than a year

Get A Narrow ± 1 Volt Band

Figure it out for yourself: you get a narrow ± 1 volt band with Allis-Chalmers distribution regulators. You get more revenue during peak loads. You don't waste kva during light loads.

Best of all, your customers are happier. Cooking is fast, lighting is right. It's easier to promote more consumer load — and more revenue — when voltage is properly regulated.

Get Years of Trouble-Free Service

And you get reliability with Allis-Chalmers distribution regulators. Eight years of field experience has proved that they give you trouble-free operation. Besides, Allis-Chalmers regulators are backed by 20 years of 5/8% step voltage regulator development.

Don't miss out on profits. Call your A-C district office today for the full story. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

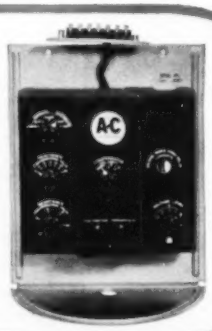
A-3835

RATINGS AVAILABLE	
	7620 VOLTS — 15-50-100 AMPS
	5000 VOLTS — 50-100 AMPS
	2500 VOLTS — 100-200 AMPS

Simple, Rugged Construction Reduces Operating Costs

MAINTENANCE COSTS ARE LOW. The simplified control shown at right is a good reason why it's so easy to install and maintain Allis-Chalmers distribution regulators. Setting the calibrated voltage level is easy and it's the only adjustment you make. Voltage band is pre-set at the factory.

The entire control can be removed and replaced easily. A single jack plug lets you disconnect all wiring fast. Complete information on the control of Allis-Chalmers distribution regulators is available in pamphlet form. It explains how you get accuracy, maximum accessibility and long life from this control. Write for the "Feather-Touch" control pamphlet, 01M7866-1.



Feather-Touch is an Allis-Chalmers trademark

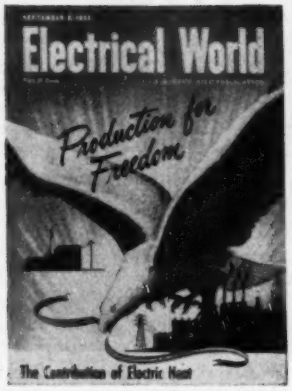
ALLIS-CHALMERS

Originators of 5/8% Step Regulation

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 138 No. 10 CONTENTS September 8, 1952



PRODUCTION FOR FREEDOM

This week many investor-owned electric companies will observe Production for Freedom Week. As in all such celebrations the glamorous developments will be the center of attention. The many worthwhile accomplishments of the industry are apt to be as neglected as the ugly duckling at the ball. But one such duckling gets the limelight in this issue—industrial electric heating.

There is nothing very glamorous about industrial electric heating. Most such installations are in manufacturing plants. The public doesn't get to see them so does not know they exist. But engineers, manufacturers, and electric utilities know they exist and realize the great contribution such installations are making to production.

Beginning on Page 103 is an 11-page section devoted to approximately 40 case study application articles and briefs supplied by industrial power salesmen. These studies show what has been done in the industrial electric heating field. They indicate what others can do. And none of us should forget that any contribution to production is also a contribution to freedom because history proves that where production is greatest there also is freedom greatest.

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for longer-lived paper insulated power cables,

ALWAYS USE THIS

OKOMETAL OF REDUCED THICKNESS
PLUS OKOSHEATH PROTECTIVE COVERING

PLUS THIS

GARRISON JOINT (Tapered reinforcement)*
*U. S. Pat. 2,571,857

Recognizing that sheath failures in underground systems take place either along the cable run or immediately adjacent to the joint, research engineers at Okonite-Callender have developed a "system" solution that, first, provides an improved cable design and, second, a superior jointing method.

1. Okonite-Callender's cable design, comprising a sheath of Okometal of reduced thickness plus Okosheath Protective Covering, *more than doubles* the life expectancy of paper-insulated cables. Because it eliminates sheath corrosion, protects the metal sheath from mechanical injury and doubles sheath resistance to fatigue failure caused by cyclic bending, the Okometal-Okosheath composite construction has become an important solution to premature lead sheath cable failure.
2. To provide *complete* protection from failures caused by concentration of stresses in the lead sheath adjacent to the joint during cyclic bending, Okonite-Callender has developed the Garrison Joint. This joint design provides a simple method for strengthening the sheath next to the joint, since it distributes stresses *along* the cable, thus providing a greatly increased area of resistance, with appreciably reduced cracking. (The Garrison Joint can be used effectively with *any* type of lead-sheathed cable.)

For the ultimate in proven insulated cable life, therefore, it is important first, to specify Okometal-Okosheath construction, and second, to augment the long life of this cable with the Garrison Joint.

FURTHER INFORMATION for installation of the joint is given in Bulletin EW-1051; Bulletin EW-1047A discusses the Okometal-Okosheath construction. They're yours for the asking. The Okonite Company, Passaic, N. J.

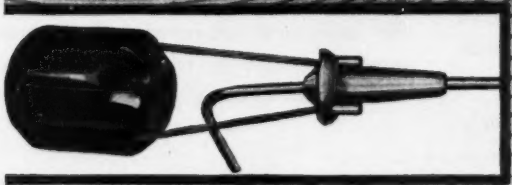
OKONITE-CALLENDER

Electroline

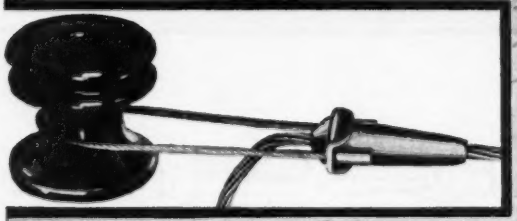
AUTOMATIC DEAD-ENDS

"AS GOOD AS NEW" AFTER TORTURE TEST

Electroline AUTOMATIC DEAD-ENDS are continually subjected to gruelling tests for strength, gripping and vibration damping features. In a typical test, 109,125,000 recorded vibrations did not develop any sign of failure of conductor in these dependable Dead-Ends. Month after month, day and night, these Dead-Ends held their positive grip and retained the full strength of the conductors. Engineers compute that the Dead-Ends withstood the equivalent of 50 years of ordinary service and state that they were as good as new at the end of the test.



3400-SERIES



The 3400-SERIES consists of an Electroline Automatic Connector, a yoke and flexible bail. These three are permanently interlocked once the conductor is inserted to form a complete unit that fits either strain or spool-type insulators.

This series permits the feeding of the conductor through the connector, eliminating the use of taps in the line span. The damping features incorporated in Electroline Dead-Ends prolong the life of conductors by preventing crystallization at the point of connection. They insure full line strength and save on construction costs by their quick and easy installation. These economical Dead-Ends can be reclaimed and used again. But, once installed, the conductor is there to stay; it cannot become detached until released by a lineman.

FOR COMPLETE DETAILS WRITE FOR BULLETIN.

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

NEW LOW COST

BREAKS ANY CHARGING CURRENT AND

THE TIME-TESTED ALDUTI INTERRUPTER SWITCH AT CONVENTIONAL AIR BREAK SWITCH PRICES

Since 1939 the reliability of the solid-material confined-arc extinction method of high voltage circuit interruption illustrated below has been proved under actual service conditions in thousands of installations for switching full rated load currents, line- and cable-charging currents, and magnetizing currents.

This circuit interrupting principle is now available in group-operated arrangements for pole-top switching at prices that compare with horn gap switches.

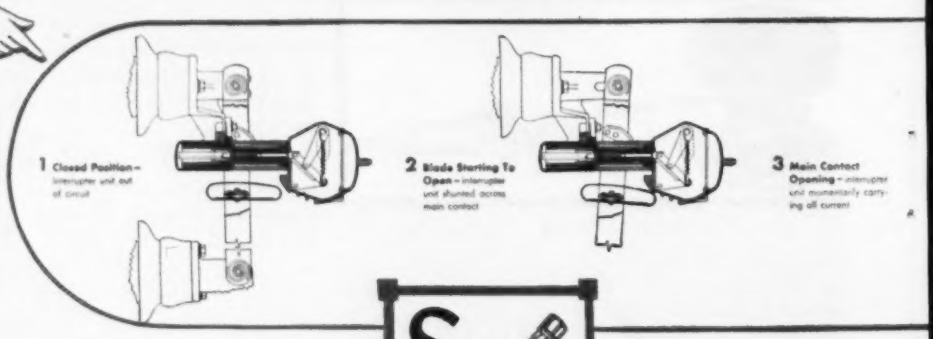
Because there is no external arc, this interrupter switch can be inverted, or mounted vertically, for simple installation and maintenance.

Further, because there is no external arc, the cost-saving side-opening design pictured here actually requires less phase spacing than a horn gap switch.

• • •

Full details are available from your local S&C representative, or the factory.

HERE'S HOW THE ALDUTI INTERRUPTER UNIT OPERATES TO PROVIDE CONFINED-ARC SWITCHING

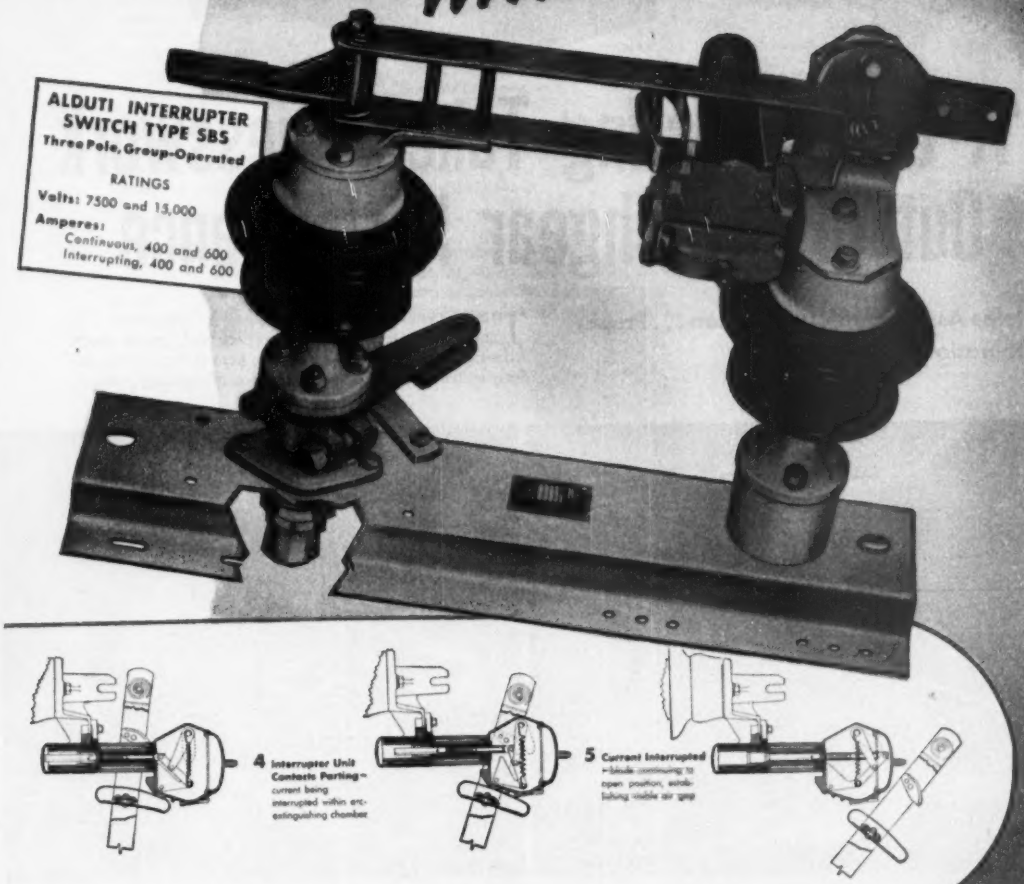

1 Closed Position – interrupter unit out of circuit
2 Blade Starting To Open – interrupter unit shunted across main contact
3 Main Contact Opening – interrupter unit momentarily carrying all current

S&C ELECTRIC

Formerly SCHWEITZER & CONRAD, INC.

POLE TOP SWITCH

FULL LOAD CURRENT *WITHOUT ARCING!*


ALDUTI INTERRUPTER
SWITCH TYPE SBS
Three Pole, Group-Operated
RATINGS
Volts: 7500 and 15,000
Amperes:
Continuous, 400 and 600
Interrupting, 400 and 600
4 Interrupter Unit Contacts Parting—current being interrupted within arc-extinguishing chamber
5 Current Interrupted—blade continuing to open position, establishing visible air gap

COMPANY

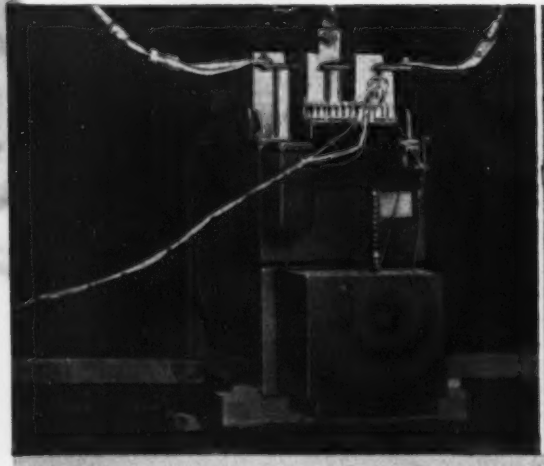
4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada: Powerlite Devices, Limited, Toronto

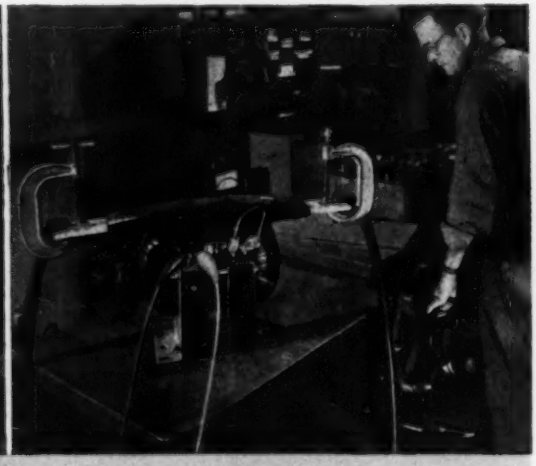
"A to Z" Testing Takes Guesswork Out of Switchgear Performance

Helps Assure Quick Installation . . . Proper Operation . . . Long Life

THREE TYPES OF TESTS — design . . . inspection . . . and routine tests are used to check and double check Allis-Chalmers switchgear. Briefly, here is the careful, orderly system of tests used to assure you of a quality product.



1. DESIGN TESTING — Most spectacular in the whole long series of design tests is the short circuit test of a Metal-Clad Switchgear breaker. Other tests in this series include impulse, temperature, dielectric, life and radio interference tests.



2. INSPECTION TESTING — Typical is this check of ratio and phase angle accuracy of instrument transformer, using highly accurate Silsbee set. Perfect operation of assembly is based on perfect operation of parts.

First in the U. S. with Metal-Clad Switchgear

TESTS

Design Tests:

short circuit interrupting test
momentary current test
temperature rise
dielectric test — one minute — 60 cycle
impulse voltage test
operational life test
radio interference test
corona level
speed graph
minimum and maximum closing voltage test
repetitive operation test
instrument transformer core loss test
instrument transformer saturation test
instrument transformer impulse test

Routine Tests:

one minute, 60 cycle dielectric test on primary and secondary circuits
closing and tripping test
minimum and maximum voltage test
speed graph
Check of: watthour meters, overcurrent and directional relays, instruments, etc. A 3 phase secondary current load and normal 3 phase potential is used
Control tests of: interlocks, throw-over schemes, sequence operational schemes, control schemes
Meets NEMA, AIEE, ASA Standards

Inspection Tests:

instrument transformer dielectric test
instrument transformer ratio and phase angle tests
analytical tests of raw materials such as: copper, silver, steel, aluminum, brass, *Bakelite* insulation
inspection of component materials: meters, relays, insulation, porcelain

In addition to testing every removable element and every stationary element to assure proper performance, every one is built to master jigs to assure easy installation and interchangeability. For switchgear you can depend on, call your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3814

3. ROUTINE TESTING — Specially built portable test wagon makes possible testing of completed switchgear right on the assembly line. This versatile unit tests: circuits, meters, interlocks, control schemes, throwovers, phasing, potential and circuit transformers, relays of all types, dc equipment, etc.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

TIDD • JENNISON
CECIL LYNCH • HAVANA
MEREDOSIA • PERMIAN BASIN
O H HUTCHINGS • REX BROWN
HICKLING • B C COBB
RUSSELL • SEWAREN
POSSUM POINT • CUTLER
PORT JEFFERSON • WHITE RIVER
POTOMAC RIVER • GADSDEN
W SPRINGFIELD • WOOD RIVER
DAN RIVER • LAKE CATHERINE
HARRY NEWMAN • JIM HILL
HUTCHISON • YATES
DUNKIRK • TITUS • LEE
CONTRA COSTA • HAWTHORN
NINEMILE POINT • EDGE MOOR
PALATKA • JOHNSONVILLE
DANSKAMMER • BECKJORD
HIGHGROVE

PLANT X

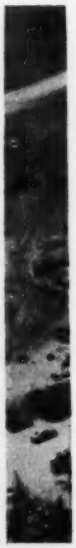
BLACK DOG
MERAMEC
ALBANY
HENNEPIN
URQUHART
EASTLAKE
OAK CREEK
ETIWANDA
AURORA
JOPPA
KINGSTON
BARRY
SUWANNEE RIVER
NELSON
LAKE CREEK
SAGUARO
SANDOW
MULLERGRAN
WILMINGTON
PORTSMOUTH
HEDDENS
EDDY COUNTY

NEW

September 23 marks the formal opening of Plant X of the Southwestern Public Service Co. of Amarillo, Texas. Its first unit, a 50,000 kw turbine-generator, has already been placed in service. With a projected ultimate capacity of 250,000 kw this will be the largest plant in the Southwestern Public Service System which comprises an area as large as the combined states of Pennsylvania and Rhode Island.

Plant X is strategically located at the geographical center of this extensive system which extends from Kansas, through the Panhandle of Texas and Oklahoma, to New Mexico. It is about midway between Amherst and Earth, Texas about 60 miles northwest of Lubbock and is interconnected by an ingenious transmission loop to supply power at full capacity to either end of the system.

Steam for the generating unit now in service is supplied by a C-E Steam Generator cross-sectional elevation and brief description of which is shown on the opposite page. The second unit, of 100,000 kw capacity, scheduled for service in 1953 will also be served by a C-E Unit.



B-603

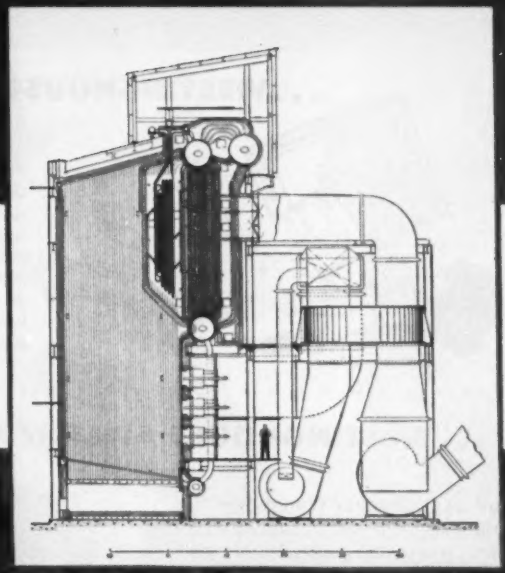
C-E

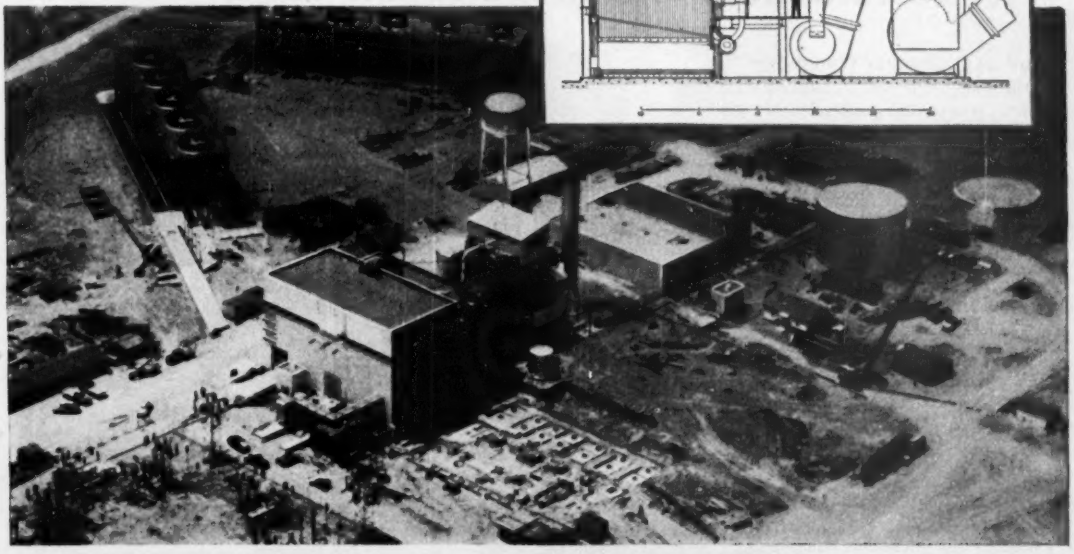
COMBUSTION

200 MADISON AVENUE, NEW YORK 16, N. Y.

Plant X goes into service

The cross-sectional view at the right shows the C-E Unit now in service at Plant X. It is of the 3-drum type with an interbank superheater in the first pass, and a regenerative type air heater at the boiler outlet. This is an outdoor type unit with no housing except that above the upper drums as indicated. The unit is horizontally fired with natural gas and oil. It is designed to supply 500,000 lb of steam per hr at 900 psi and 900 F.





ENGINEERING—SUPERHEATER, INC.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

"Everybody uses POWER!"

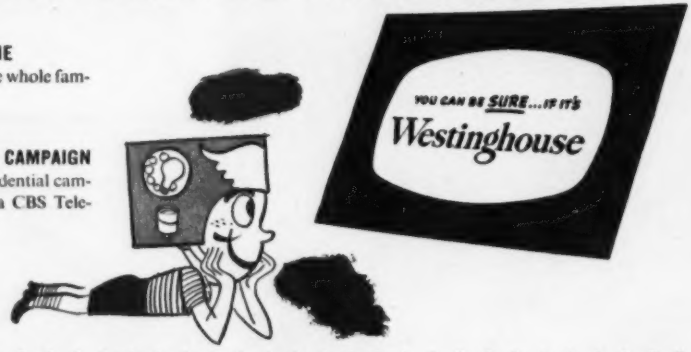
...WESTINGHOUSE SELLS IT IN LIFE

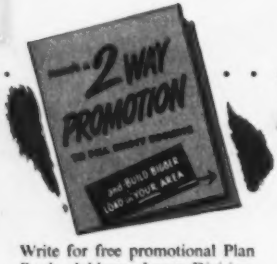
Four color ads in LIFE on September 15, October 13 and October 27 will reach 41,100,000 readers. School kids in every family need more light now. The special Ball Point Pen Premium offer will make Westinghouse Light Bulbs the brand women will buy. And a year 'round schedule in LIFE will continue to sell Westinghouse Bulbs—and keep 'em sold—to everybody who uses power.

...WESTINGHOUSE SELLS IT ON TV AND RADIO

ON WESTINGHOUSE STUDIO ONE
Hard-hitting commercials catch the whole family right in the living room.

THRU-OUT THE PRESIDENTIAL CAMPAIGN
Westinghouse brings historic Presidential campaign coverage to every home via CBS Television and Radio.





Write for free promotional Plan Book. Address: Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

And now WESTINGHOUSE helps you sell even MORE at the POINT OF SALE

Use the Westinghouse Promotional Plan Book to fill empty sockets in the homes you serve. See how small-fry spark those light-bulb purchases Mom forgot when you use the SPACE ROCKET HAT and MARS MAN MASKS as Shopping Bags. Build a bigger power load with counter displays that feature the Westinghouse Ball Point Pen Premium.

YOU CAN BE SURE...IF IT'S

Westinghouse

CRITICAL POINTS ON DISCONNECT SWITCHES

HINGE—with R&IE Sealed Pressure Contact

Electrically and Mechanically

R&IE

SEALED PRESSURE HINGE CONTACTS

are

Check the Facts

PROPERLY DESIGNED—

a. Small Radii—less friction. Minimum of shear area to break ice.

b. Continuous, annular, constant electrical contact at all times—eliminates second make-and-break.

PROPERLY APPLIED—

a. Pressure loading in line with hinge axis, easier operating.

b. Sealed, with inhibiting agent, no inspection required.

PROVEN IN PERFORMANCE—

a. High current momentary tests—(more than twice the switch rating)—enough to damage the make-and-break contact, fail to affect the hinge pin.

b. All ice tests prove that the small hinge radii, in shear, contributes to the ease of operation.

CUT SWITCH TROUBLE IN HALF—SPECIFY THE TTR49!

I-T-E R&IE

R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PENNSYLVANIA

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

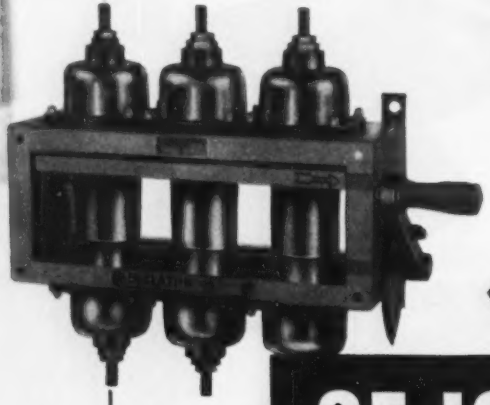
the STRAIGHT LINE disconnect

SAVES SPACE AND MATERIAL

The ISOLATOR'S straight line telescoping action performs disconnect operations using no more space when open than when closed. The insulator bushings also telescope effectively shielding live parts and eliminating the need for additional flash barriers. The ISOLATOR occupies about ⅓ the space needed for a comparable blade type switch and as it uses less space a smaller enclosure can be used if needed.

GIVES EXTRA MARGIN OF SAFETY

Current carrying parts are recessed within the upper and middle bushings. When ISOLATOR is open a full open gap is provided between live parts. The clearance between these *bushings*, however, is narrow, preventing accidental contact but at the same time giving visible evidence that device is open. The exposed upper and lower studs are arranged for easy taping. These features insure a definite superiority in safety. A man working in an ISOLATOR equipped cubicle has complete freedom from live part hazards.



3.P.S.T. 400 ampere 5000 volt ISOLATOR

167 DIFFERENT ISOLATOR UNITS ARE AVAILABLE

ISOLATORS are made in one, two, three and four pole units to 15000 volts and to 2000 amperes... factory assembled to meet your requirements.

FOR FULL DATA
WRITE FOR BULLETIN 140

3E ISOLATORS

THREE E

ELECTRICAL ENGINEERS EQUIPMENT CO. MELROSE PARK, ILLINOIS

HOW TO SIMPLIFY YOUR STORAGE

Now — one multi-purpose Grease will handle virtually all your Grease Requirements!

Reduced inventory . . . less chance for error in application . . . savings in maintenance. These are but three of the big benefits you get with Gargoyle Grease BRB No. 1.

This single, multi-purpose grease will provide correct lubrication for practically all normally loaded anti-friction and plain bearings in the average industrial plant. It resists leakage and "wash out," protects against rust and corrosion, lasts many times longer in anti-friction bearings than conventional greases.

Why use more than the one grease when one will do? Call your Socony-Vacuum representative.

Send for informative pamphlet about Gargoyle Grease BRB No. 1. Write to Socony-Vacuum Oil Company, Inc., 26 Broadway, New York 4, N. Y.

SOCONY-VACUUM

SOCONY-VACUUM

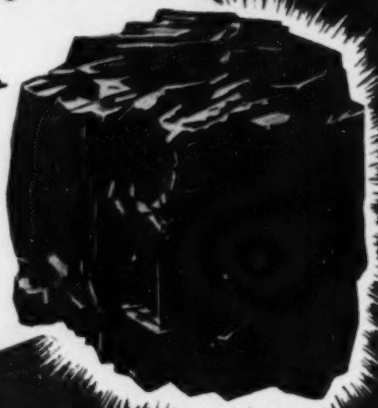
Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

MEMO TO THE UTILITY INDUSTRY:

Base your expansion on a fuel that's dependable



• In 1951, the great machine that is America required about 370 billion kilowatt-hours of electrical energy. Estimates point to a six-fold increase in this electric power load by 1975.

Bituminous is playing a role of ever increasing importance as a source of this energy. In 1951, the electric utilities consumed approximately 102,000,000 tons, the highest on record. Alert utility executives recognize this and are planning new facilities to use the fuel that will be available in unlimited supply for years to come.

In Baltimore & Ohio territory is a large proportion of America's operating mines as well as billions of tons of undeveloped reserves. Consider these excellent quality, economically accessible coals when planning for new utility power for both the present and the future. For further advice, *ask our man!*

BITUMINOUS COALS FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—better!

with **Variac**®

MOTOR SPEED CONTROLS

Run d-c Motors from a-c Lines with

Continuously Adjustable Speeds *from Zero to Higher than Rated...*

Selenium Rectifiers — *no electron tubes — no warm-up time — normal rectifier life in excess of 15,000 hours.*

Good Regulation — *low power-supply impedance gives good regulation over wide speed range*

Wide Speed Range — *continuously variable from rated speed down to zero — optional range to 15% above base speed*

Smooth Torque — *low ripple in armature current gives very smooth torque — suitable for the most critical applications*

Instant Forward-Stop-Reverse Control — *at any speed setting — dynamic braking on all models above 1/15 hp*

Negligible No-Load Loss *during stand-by periods*

Low First Cost — *simple, compact, rugged single-unit construction — can be mounted anywhere near or on machine — no remote cabling necessary*

Easy Maintenance — *essentially maintenance free — VARIAC brush replaced by anyone — controls readily removed from permanently mounted housing without disturbing any wiring*

Prices: VARIAC Motor Speed Controls

1701-AK — 1/15 hp and less (shunt motor)	**$75**
1701-AU — 1/15 hp and less (series & universal motor)	**$75**
1700-B — 1/4-1/3 hp (compound motor)	**$160**
1702-A — 1/2-3/4 hp (compound motor)	**$230**

(1/15, 1/3 and 3/4 hp standard motors may be purchased from General Radio Company. Prices from $33 to $80.90)

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts

GR

Fill In Coupon For Complete Data

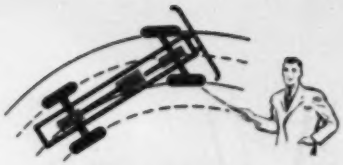
Please send complete information on G-R VARIAC Motor Speed Controls. 551

*Name*_____

*Company*_____

*Street*_____

*City*_____ *Zone*_____ *State*_____



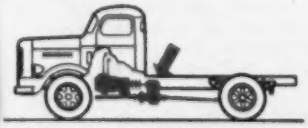
Fully Compensated Drive... three free-acting differentials compensate for the difference in travel of all four wheels. Reduces drive line strains, eliminates needless tire wear.

Proper Weight Distribution . . . only a true 4x4 gives you the added weight on the front wheels needed to gain the necessary traction to speed utility line work regardless of weather or terrain.

Speed Line Work...Anywhere!

only FWD has all these features for faster, more reliable line construction and maintenance

Full Torque P.T.O. . . . utilizes full engine power through all transmission speeds. An exclusive safety lock prevents truck drive while boring operations are proceeding.



Two-Speed Aux. Transmission . . . doubles the number of transmission gear ratios. Provides low gear ratio for full power at extreme low speeds needed for tough, cross-country operations.

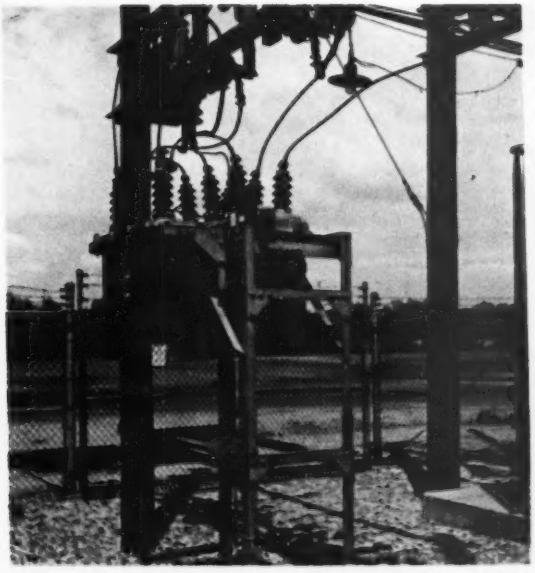
Over 78 Matched Combinations . . . Now choose the exact "mobilized tool" that meets your requirements . . . and deal with *only one* source for complete service and supply.

Faster, Safer, More Economical

FWD "mobilized tools" for line construction and maintenance were designed with the aid of utility men for utility service. This policy of *"building in"* features that you want, results in superior equipment that gets crews and tools to the job in a hurry in spite of weather, terrain, or bad footing. See your FWD Dealer to get the facts on how FWD "mobilized tools" help keep construction on schedule . . . speed service restoration . . . earn more for your equipment dollar. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. — Kitchener, Ont.

Built by the makers of America's Foremost Heavy-Duty Trucks

The greatest recloser development since Kyle pioneered dual timing



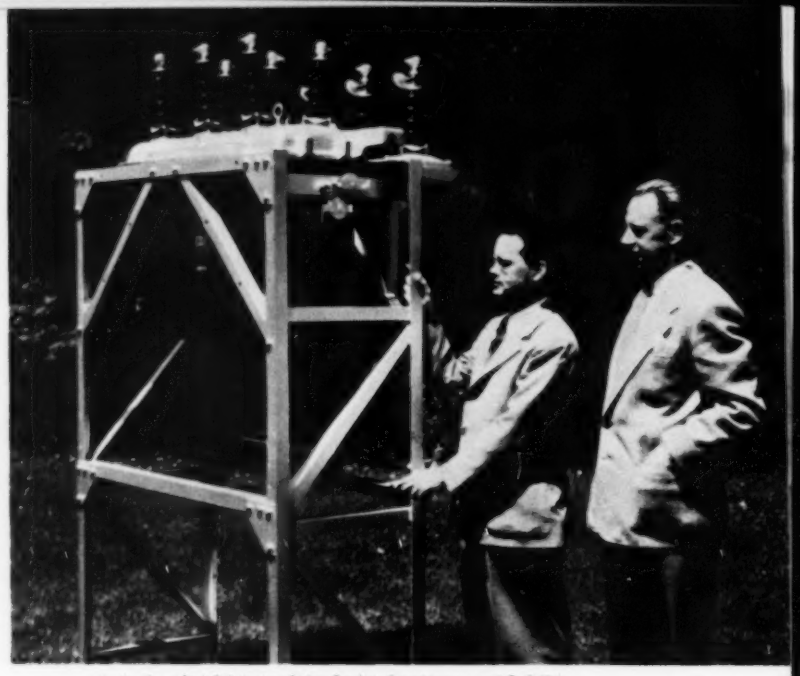
A Type R Recloser at St. Joe substation of Indiana-Michigan Electric Company, Ft. Wayne; and, above, a pole-mounted Type R on the lines of a southwestern power company. The Type R gives 3-phase protection up to 100,000 kva, as described in the following pages.

First 3-phase power-class recloser with 100,000 kva interrupting rating.

Completely self-contained unit provides automatic protection of substation feeders at less than half the cost of using substation breakers. Also used on feeder lines with heavy loads and high fault currents.

Available with ground trip solenoid and current transformer.

All three phases trip simultaneously when fault occurs on any one phase, preventing feedback.



A. Van Ryan (right), Director of New Products Development, and R. C. Kirk, Manager, Kyle Products Sales, demonstrate the new Kyle Type R Recloser, shown with ground trip solenoid and current transformer, at right, in mounting frame for substation use. Also available with frame for pole mounting.

L-M Announces Kyle Type R 3-phase Heavy Duty Recloser

By R. C. KIRK,
Manager, Kyle Products Sales, Line Material Company

To meet the growing need for power-class protection on 3-phase lines, L-M engineers have developed a heavy-duty recloser that provides simultaneous tripping of all three phases on feeders with heavy loads and high fault currents.

This is a new and very desirable feature in heavy-duty 3-phase reclosers. It prevents high transient voltages sometimes encountered with single-phase switching on delta systems; and on wye systems it prevents feedback which might cause trouble on heavily loaded 3-phase circuits.

6000 Amperes Interrupting Rating

This recloser, known as the Kyle Type R, is a rugged, dependable unit capable of replacing breakers in substations with up to 100,000 kva fault capacity. The recloser is rated 25 to 280 amperes nominal load, trips at from 50 to 560 amperes, and interrupts up to 6000 amperes at 4.8 kv, or 4000 amperes at 14.4 kv.

Ground Fault Tripping

The Type R is available with a current transformer and ground trip solenoid that will trip the recloser at from 50 to 400 amperes.

This new Kyle Type R has been in continuous use in substation and pole line applications of several power companies for a period sufficient to substantiate design calculations and the extensive tests in the "Know House," L-M's short-circuit test laboratory.

Provides Dual Timing

Because it interrupts so much faster than breakers, the Type R permits co-ordination with fuses, eliminating unnecessary fuse blowing on temporary faults and thus substantially reducing service calls.

KYLE Type R Series Trip Coil Ratings

Nominal Load Rating Amperes	Minimum Tripping Current Amperes	Interrupting Rating* Symmetrical RMS Amperes at Maximum Phase-to-Phase Nominal Voltage of: 4.8 kv	14.4 kv
25	50	1500	1500
35	70	2100	2100
50	100	3000	3000
70	140	4200	4000
100	200	6000	4000
140	280	6000	4000
160	320	6000	4000
185	370	6000	4000
225	450	6000	4000
280	560	6000	4000

*Recloser interrupting ratings are based on the maximum test circuit X/R ratio of not less than 8, and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

Closing Solenoid Voltage Ratings in complete range from 2.4 to 14.4 kv.

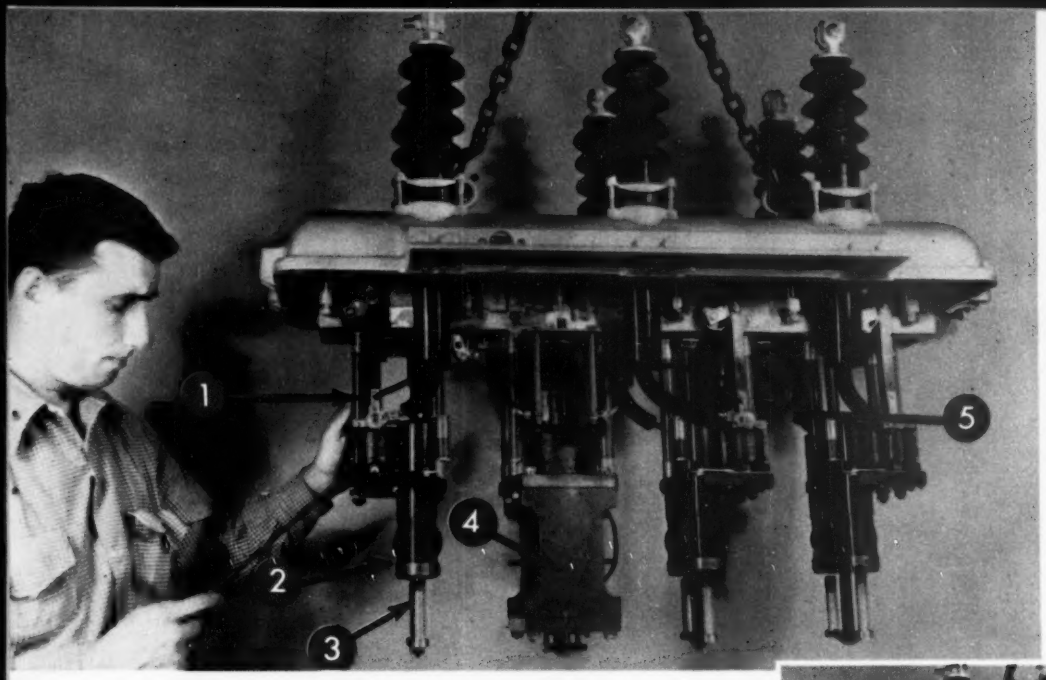
The 160 and 225 ampere ratings are available for special coordination problems. When either of these two ratings is used in series with other reclosers, minimum trip currents should have a ratio of not less than 1.32 for best coordination.

Ground Solenoid Settings: Minimum Pickup Current primary, amperes: 50; 67; 100; 133; 200; 400.

Three time-current curves; A, fast; B, retarded; C, extra-retarded. Available in any of seven sequences.

Trip coils, closing coil, and sequences easily changed in the field.

Insulation Level: full power class; meets ASA, NEMA, AIEE standards for 15 kv station equipment, as follows:
60 cycle one-minute withstand, dry: 50 kv
60 cycle ten-second withstand, wet: 45 kv
1½ x 40 ms surge withstand (BIL): 110 kv



Open view of the completely self-contained Type R recloser. Les Larson, Assistant Design Engineer, points to one of the series trip solenoids. Photo also shows (1) tripping linkage; (2) one of the oil cross blast arc extinction chambers; (3) contact structure (contacts in open position); (4) closing solenoid; (5) ground trip solenoid (on opposite side).

Applications for the Type R

Because of its operating advantages, the savings it affords in service calls, and its low cost in comparison with substation breaker equipment, this recloser will no doubt replace breakers in many cases. The low cost is possible because the Type R is a single, self-contained unit, designed, manufactured, and tested on a standardized basis, with all the economies this implies. It will also be used in many line locations where heavily loaded 3-phase feeders justify this protection.

Complete Automatic Protection

With this new unit, Line Material now offers a complete range of automatic protection, with both single-phase and 3-phase reclosers, in the entire range up to 6000 amperes interrupting rating at 4.8 kv, and 4000 amperes at 14.4 kv. Thus L-M now provides complete, coordinated automatic protection from substation to load.

DESIGN AND OPERATING FEATURES

Operation completely automatic. On permanent faults recloser opens and recloses three times, and then locks out. On temporary faults the fast openings permit the fault to clear; if it is not cleared, the time delay operation blows the sectionalizing fuse, and the recloser resets itself for another complete cycle. Type of fault—3-phase, single-phase, or phase-to-ground—does not affect the timing.

Time Delay System, located above oil level and is Silicone fluid filled.

Operating curves: A, fast; B, retarded; C, extra-retarded. Seven possible standard sequences or combinations. Sequences easily changed in the field.

Dual Contacts, with oil cross-blast arc extinction which has proved so successful on the Kyle Type L.

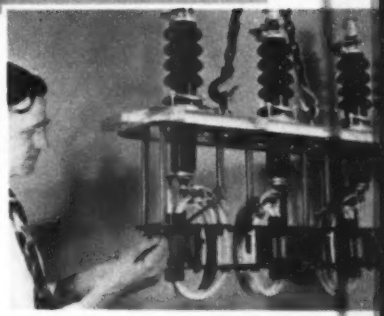
Clamp-on bushings, easily replaced; plated "Universal" terminals for both copper and aluminum, No. 6 solid to 250 MCM stranded conductor.

Kyle non-reclosing feature, for extra safety, standard equipment.

Operating handle, counter, and non-reclosing feature lever easily accessible under sleet hood. Trip-free operating handle.

Let Us Answer Your Questions

Ask the L-M Field Engineer for a copy of Bulletin CR1C —or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



3-phase oil-filled current transformer, used with ground trip solenoid for ground fault tripping. Primaries are connected one in each phase through coaxial bushings, and secondaries are in parallel. If the three primaries have unbalanced currents, an unbalanced current will flow in the secondaries and energize the ground trip coil, which then operates the recloser in the same manner as the series trip coil.

Top view of Type R recloser connected to TR transformer at right, in substation mounting frame. Both transformer and recloser are filled with ORTO®, L-M's oxidation-resistant transformer oil. Oil filler plug with ¾" standard thread, located on top of tank, has dip-stick attached.

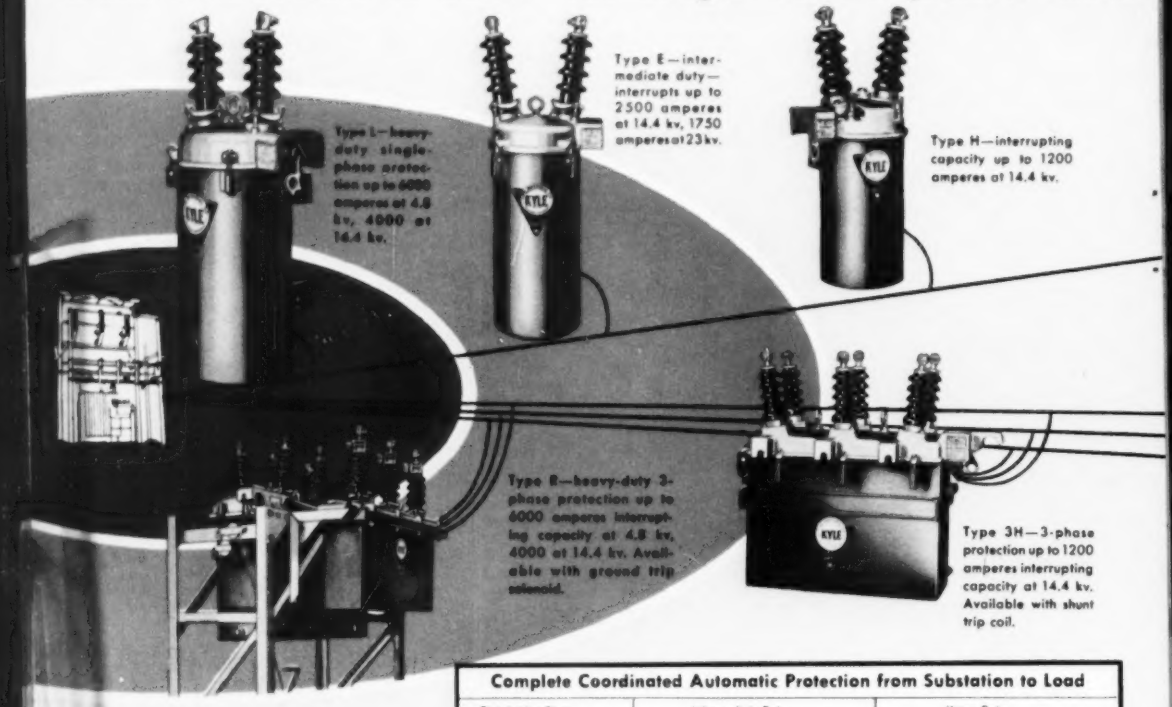
LINE MATERIAL

Kyle Reclosers

L-M now offers

Complete Automatic Recloser Protection

from Substation to Load—for single and 3-phase lines


Type L—heavy-duty single-phase protection up to 6000 amperes at 4.8 kv, 4000 at 14.4 kv.
Type E—intermediate duty—interrupts up to 2500 amperes at 14.4 kv, 1750 amperes at 23 kv.
Type H—interrupting capacity up to 1200 amperes at 14.4 kv.
Type R—heavy-duty 3-phase protection up to 6000 amperes interrupting capacity at 4.8 kv, 4000 at 14.4 kv. Available with ground trip solenoid.
Type 3H—3-phase protection up to 1200 amperes interrupting capacity at 14.4 kv. Available with shunt trip coil.

New Kyle heavy-duty Type R 3-phase recloser makes L-M first to offer a complete, coordinated line

As shown in the illustration, L-M now provides complete automatic protection from substation to user, in both single-phase and 3-phase recloser units.

The new Kyle Type R provides up to 100,000 kva interrupting capacity—up to 6000 amperes—ample for a good-sized substation or for heavily loaded feeders with high fault currents. The Kyle Type 3H completes the 3-phase line with up to 1200 amperes interrupting capacity.

In single-phase, the Kyle Type L provides up to 6000 amperes, for substation or heavily loaded feeders; the Type E covers the range from 1200 to 2500 amperes, and the Type H provides single-phase protection up to 1200 amperes.

Ask the L-M Field Engineer for information and bulletins on the complete Kyle line; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Complete Coordinated Automatic Protection from Substation to Load

Distribution Class Nominal Voltage Rating 14.4 kv BIL 95 kv			Intermediate Duty Nominal Voltage Ratings 23 kv BIL 150 kv				Heavy Duty Nominal Voltage Ratings 14.4 kv BIL 110 kv			
Single-Phase Type H Three-Phase Type 3H			Single-Phase only Type E				Single-Phase Type L Three-Phase Type R			
Rating Amps.	Min. Trip	Inter. Rating* 14.4 kv	Rating Amps.	Min. Trip	Inter. Ratings* 14.4 kv	23 kv	Rating Amps.	Min. Trip	Inter. Ratings* 4.8 kv	14.4 kv
5	10	150	5	10	200	125	....	....	....	....
10	20	250	10	20	400	250	....	....	....	....
15	30	375	15	30	600	375	....	....	....	....
25	50	600	25	50	1000	625	25	50	1500	1500
35	70	840	35	70	1400	875	35	70	2100	2100
50	100	1200	50	100	2000	1250	50	100	3000	3000
			70	140	2500	1750	70	140	4200	4000
			100	200	2500	1750	100	200	6000	4000
							140	280	6000	4000
							160#	320	6000	4000
							185#	370	6000	4000
							200**	400	6000	4000
							225#	450	6000	4000
							280#	560	6000	4000

*Recloser interrupting ratings are based on the maximum test circuit X-R ratio of not less than 8 and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

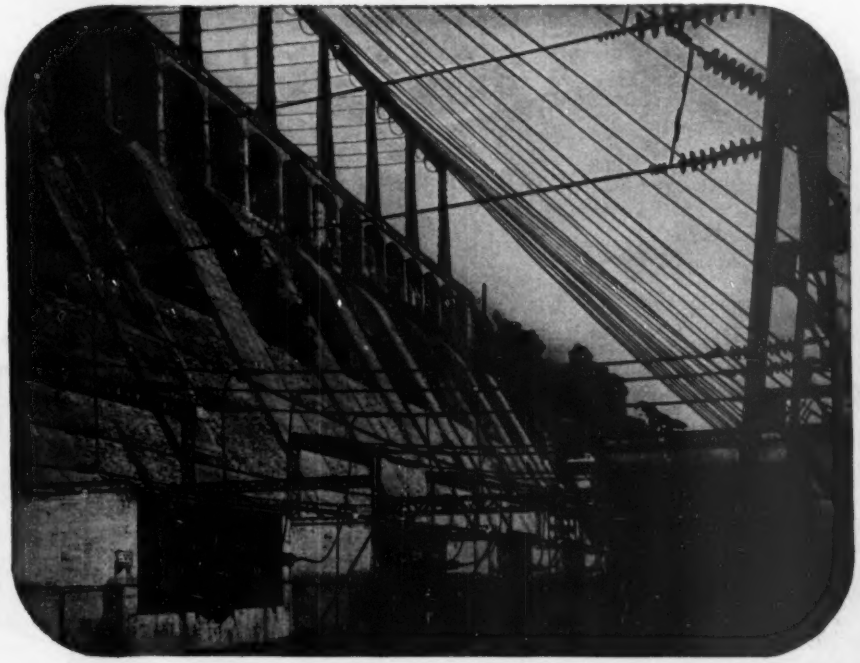
#Available in three-phase Type R only. **Available in single-phase Type L only.

For Ground Fault Tripping: Type R heavy-duty 3-phase recloser is available with built-in ground trip solenoid and auxiliary current transformer. Type 3H is available with a shunt trip coil which may be used for ground fault tripping with suitable auxiliary equipment.

LINE MATERIAL Kyle® Reclosers

COMPLETE COORDINATED AUTOMATIC PROTECTION FROM SUBSTATION TO LOAD

V. C. CABLE



Specify Roebling V. C. Cable for top resistance to heat, oil and grease

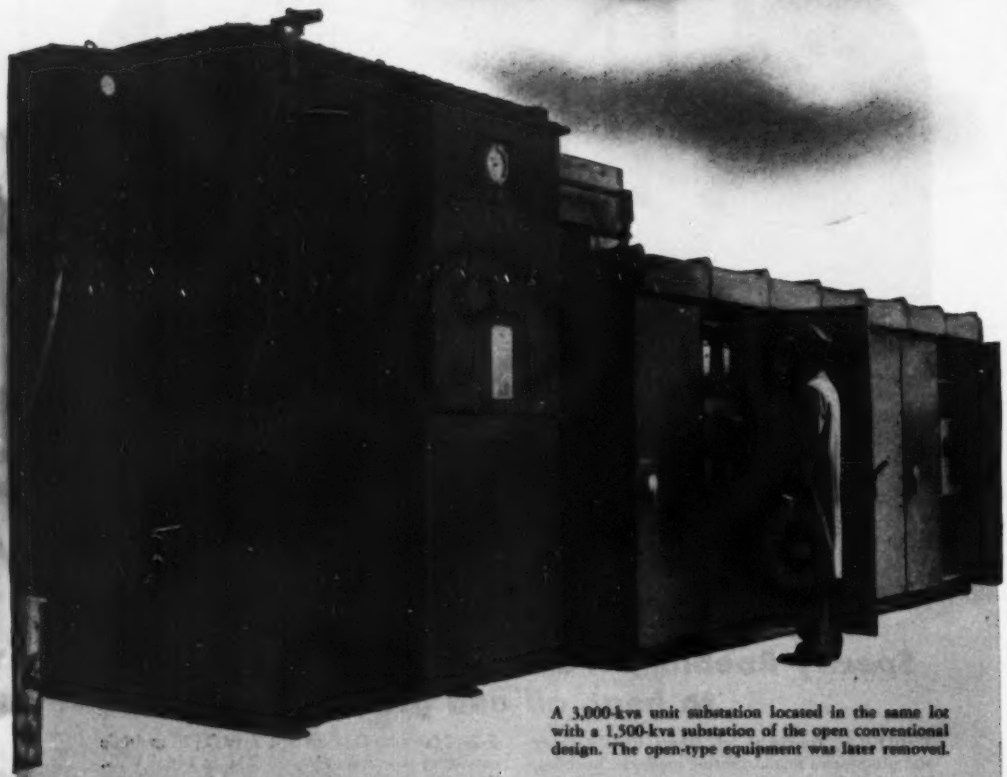
THROUGH continual laboratory developments and progressive manufacturing methods, Roebling Varnished Cambric Cable has been constantly improved. Today this cable has absolutely top resistance to heat, oil and grease . . . and it's the most dependable cable you can use for leads on generators, transformers, motor and oil switches, and for general distribution of heavy power loads in manufacturing and industrial plants.

Roebling V.C. is made in single conductor sizes from 2,000,000 C.M. to #14 A.W.G.; in multiple conductor sizes from 750,000 C.M. to #14 A.W.G. Recommended for use to 17,000v between phases in single or multiple conductor construction; and to 26,000v for single conductor grounded neutral.

Large quantities of Roebling's complete wire and cable line are now required for rearmament. We and our distributors will, however, do all that we can to meet your needs. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 61 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5348 E. HARBOR ST & 150 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1930 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH 1501 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 2001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY



A 3,000-kva unit substation located in the same lot with a 1,500-kva substation of the open conventional design. The open-type equipment was later removed.

Midwest utility modernizes system, solves load problem

WITH WESTINGHOUSE UNIT SUBSTATIONS

The experience of Iowa-Illinois Gas & Electric Company with unit-type substations will interest progressive system planners. It suggests a way to attain this important objective: *a simplified flexible system providing long-range operating economies.*

"Load growth in our area made it imperative for us to modernize our distribution system. After considerable study it was decided to use factory-built, unit-type substations.

"Westinghouse Unit Substations of co-ordinated unit design met our requirements . . . maintenance has been very slight . . . location of the substations close to the load center keeps losses to a low value and provides for better regulation. Future expansion is simply and economically handled by adding unit substations in areas of maximum load growth —or by moving a substation in its entirety, if load shifts, thereby salvaging the bulk of the investment."

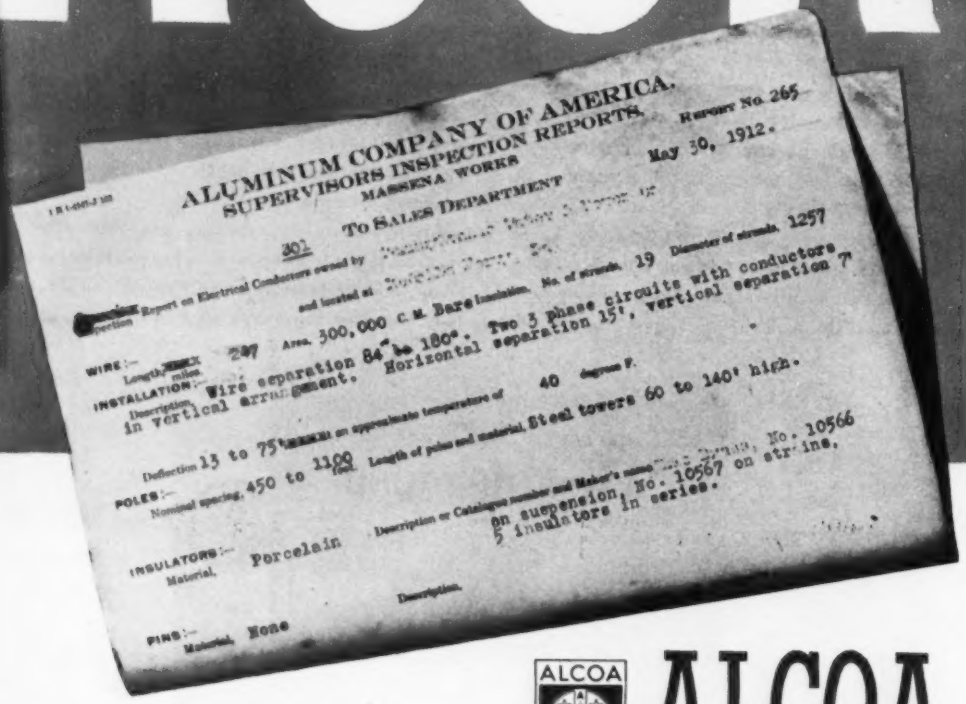
Iowa-Illinois Gas & Electric enjoys these benefits because Westinghouse Unit Substations are specifically designed to meet today's power distribution problems. Unitized construction simplifies expansion to accommodate increased load requirements. Individual feeder regulation can often be eliminated and Westinghouse Unit Substations offer these same advantages to you.

For complete information, get your copy of Booklet B-4061. Ask your Westinghouse Representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60779

YOU CAN BE SURE... IF IT'S Westinghouse

UNIT SUBSTATIONS

ACSR



ALUMINUM COMPANY OF AMERICA.
SUPERVISORS INSPECTION REPORTS.
MASSENA WORKS
Report No. 265
May 30, 1912.

To SALES DEPARTMENT

302

Report on Electrical Conductors owned by

and located at

WIRE:— Length, miles 247 Area 300,000 C.M. Bare Insulation No. of strands 19 Diameter of strands .1257

INSTALLATION:— Description Wire separation 84" be 180°. Two 3 phase circuits with conductors in vertical arrangement. Horizontal separation 15', vertical separation 7'

Deflection 13 to 75' on approximate temperature of 40 degrees F.

POLES:— Nominal spacing 450 to 1100 feet Length of poles and material Steel towers 60 to 140' high.

INSULATORS:— Material Porcelain Description or Catalogue number and Maker's name No. 10566 on suspension, No. 10567 on strains. 5 insulators in series.

PINS:— Material None Description

ALCOA ALUMINUM

ALCOA

and Alcoa Experience

Shown here is an Alcoa field service report dated May 30, 1912. It's one of several made on a line that's still in service. In the forty years since the report was written, we've been adding constantly to our firsthand knowledge and on-the-job experience by cooperating with our customers in the field.

Alcoa entered the aluminum conductor business over 35 years ago. We've been in it... leading the field... ever since. Those years of high line experience on thousands of successful jobs, the reports of Alcoa experts who have helped string lines throughout the country, have been incorporated into Alcoa's manufacturing techniques.

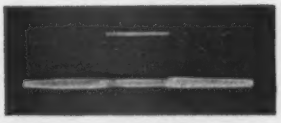
That's why you get the highest quality wire and cable, aluminum or ACSR, from Alcoa. Cable with uniformly correct stranding . . . a galvanized steel core that meets ASTM specs. Quality features built into the product by careful Alcoa workmanship, checked by rigid Alcoa inspection, backed by half a century of Alcoa experience.

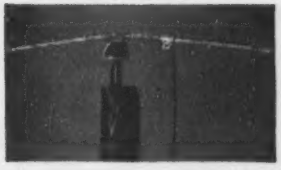
Look to Alcoa for your aluminum wire and cable . . . and buy with assurance!

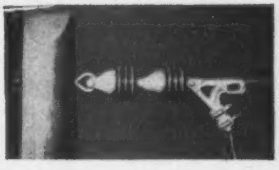
ALUMINUM COMPANY OF AMERICA
2180-J Gulf Building • Pittsburgh 19, Pennsylvania

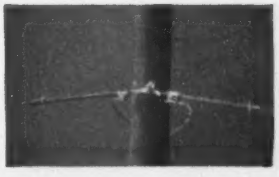
ALCOA ACCESSORIES

Alcoa offers a complete line of job-proved accessories for aluminum cable and ACSR.









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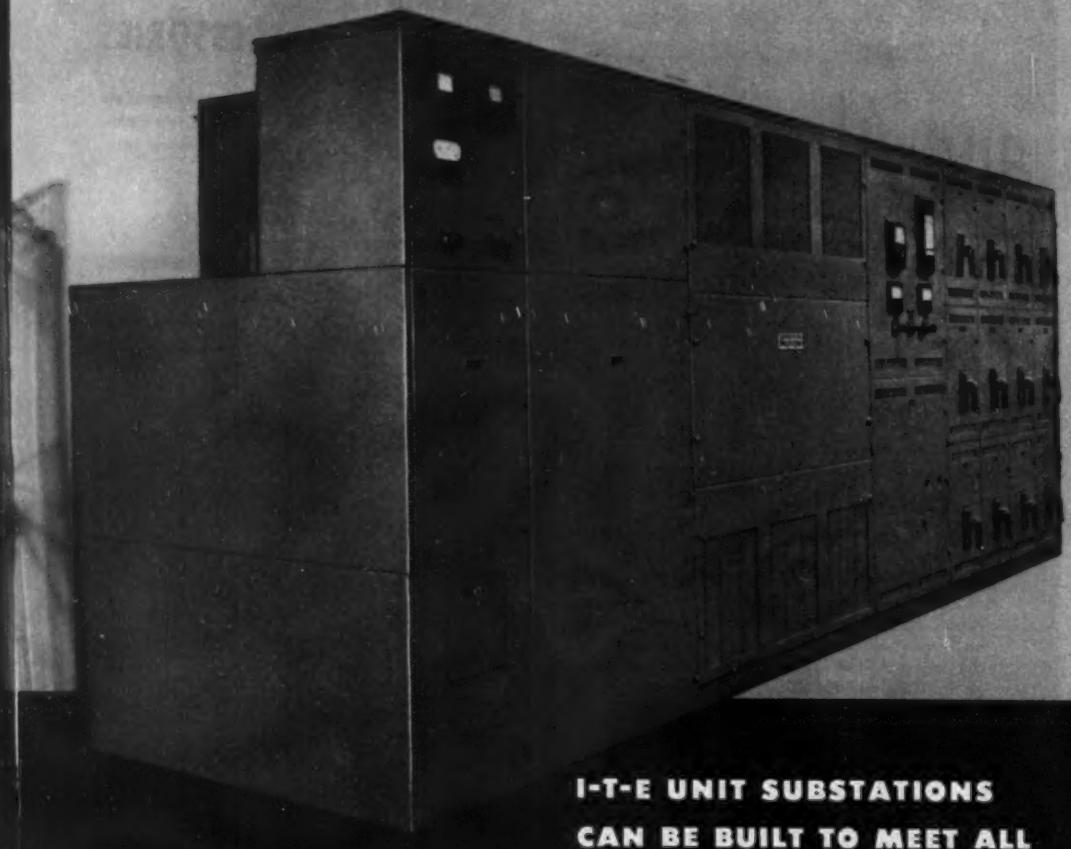
FIRST IN ALUMINUM
FIRST IN A·C·S·R

HOW MUCH WOULD A POWER



TRANSFORMER TYPES INCLUDE:

OISC

Non-inflammable liquid-filled

Class B air-cooled (illustrated above)

Class H air-cooled

Class H, nitrogen-filled, sealed tank

I-T-E UNIT SUBSTATIONS CAN BE BUILT TO MEET ALL NEMA "USUAL and UNUSUAL" SERVICE CONDITIONS

Indoor and outdoor – in any required ratings

YOU SAVE THROUGH –

1. Better voltage at point of use.
2. Lower conductor cost—shorter runs of LV cable.
3. Shorter installation time—Substations shipped as complete packages.
4. Use of lower interrupting capacity breakers.

GET THE FULL STORY–

See your local I-T-E representative for details—or write for Catalog Section 9000 today.

FAILURE COST YOUR PLANT?

Suppose a prolonged power interruption suddenly hit your plant! How much would it cost you in lost production, down-time—perhaps ruined product, equipment damaged beyond repair?

To all plants, *service continuity* means profits. In some, service continuity is the most important single consideration in planning the vital electrical distribution system.

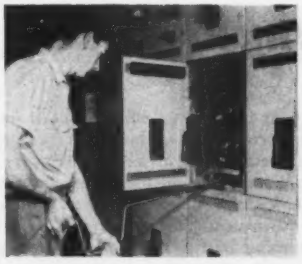
Assure service continuity—Install modern I-T-E Unit Substations

No matter what your service continuity requirements may be, I-T-E can offer you the benefits of long experience—supply the equipment to meet them all. You get:

FLEXIBLE SYSTEM PLANNING. *Sectionalization* (I-T-E Unit Substations strategically spotted throughout the plant) *limits* the area affected by power interruption. You can plan your system to provide immediate restoration of service—or actual *elimination* of interruption on unaffected circuits.

SELECTIVE TRIPPING. Sectionalization can be carried right down to the *individual* I-T-E circuit breaker—the individual machine or feeder. The versatile I-T-E Direct-Acting Selective Overcurrent Trip Device helps *isolate* faults. If there's a sustained overcurrent or short circuit in any branch of the system, only the breaker closest to the fault will open.

MODERN DRAWOUT CONSTRUCTION. Even maintenance requires little or no down-time. With modern I-T-E drawout construction, total outage time during maintenance is only a few minutes. Circuit breakers of like characteristics are interchangeable. One spare breaker—for quick replacement—provides economical insurance for a number of feeder circuits.

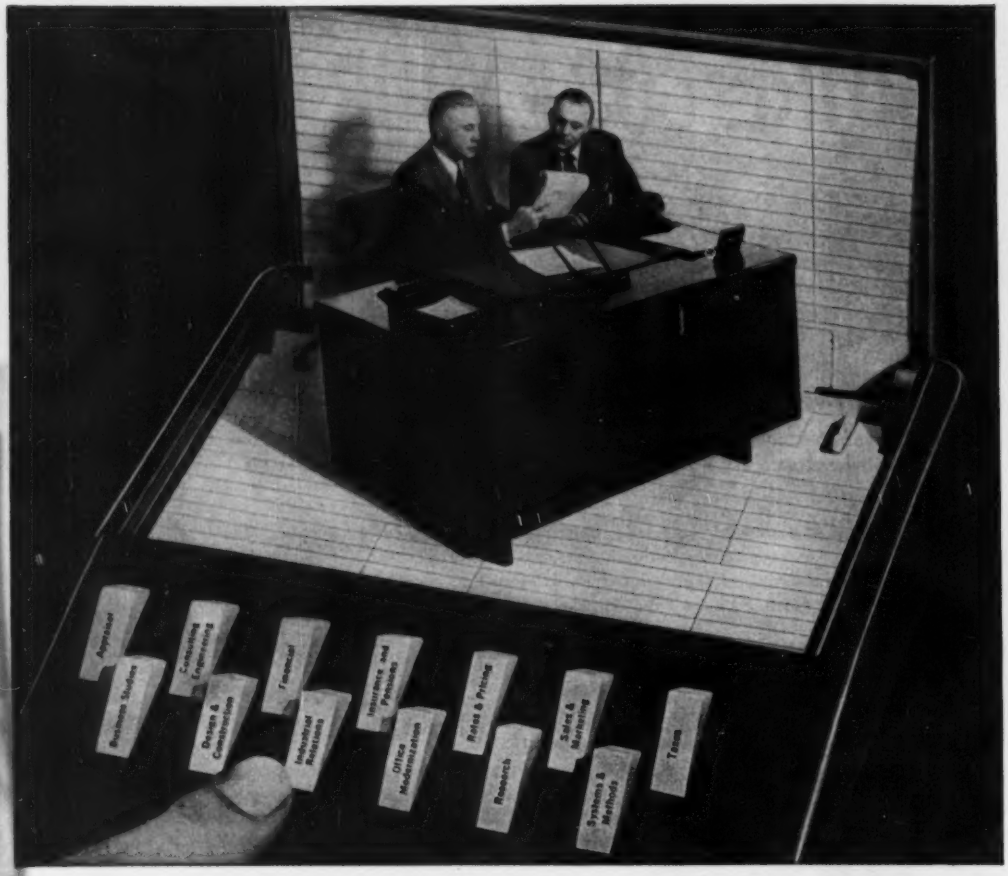


I-T-E

UNIT SUBSTATIONS

I-T-E CIRCUIT BREAKER CO. • 19TH & HAMILTON STS. • PHILA. 30, PA.

CANADIAN MFG. & SALES: EASTERN POWER DEVICES, LTD., TORONTO • EXPORT SALES: PHILIPS EXPORT CORP., N. Y. 17, N. Y.



WHICH OF THESE SERVICES WILL HELP YOU?

At your fingertips, through EBASCO, are engineers, constructors, business consultants—specialists who can help solve your most troublesome business problem quickly and economically. Solve it, moreover, without adding permanently to your payroll . . . without disturbing existing company relationships.

Need help with financing? During the past few years EBASCO has advised on the raising of over two billion dollars in new capital. Is industrial relations your current business headache? EBASCO has assisted in planning and developing many outstanding industrial relations programs. EBASCO has devised efficient systems and methods; designed and built over one billion dollars worth of new plants. EBASCO has developed insurance, pension and safety programs . . . made appraisals . . . sales and marketing studies . . . solved production and plant layout problems and performed many similar services for business and industry throughout the world.

EBASCO will do all or any part of a job, for companies large or small. To find out *exactly* how we can serve you best, write for your copy of "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6.

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EBASCO TEAMWORK GETS THINGS DONE ANYWHERE IN THE WORLD

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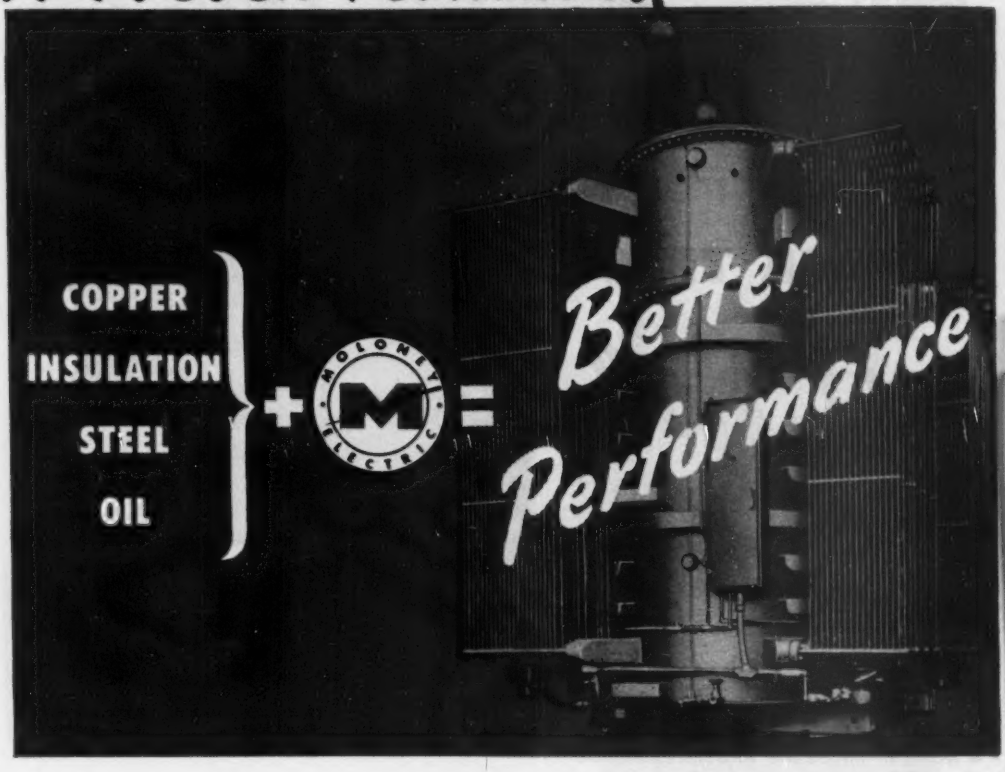
A Proven Formula!



ALTHOUGH the same basic materials—copper, insulation, steel and oil—are used in the construction of any power transformer, the intangible "know how" is the most important factor contributing to its quality of performance. Moloney has acquired this knowledge and skill through experience in the manufacture of transformers exclusively since 1896. Engineering and manufacturing facilities are supplemented by a complete test department which includes a 3,500,000 volt surge generator. Operating records prove that you can expect *better* performance, *less* maintenance cost and *greater* reliability from Moloney Transformers.

MEB1-10

MOLONEY ELECTRIC COMPANY

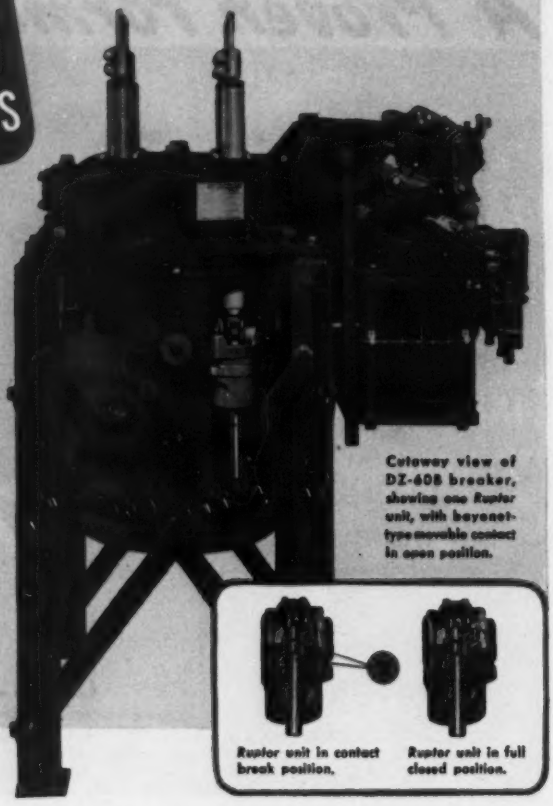
Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

ALLIS-CHALMERS

Oil Circuit Breakers

CHECK THIS "Inside Story"



Cutaway view of DZ-608 breaker, showing one *Ruptor* unit, with bayonet-type movable contact in open position.

Ruptor unit in contact break position.

Ruptor unit in full closed position.

A LOOK INSIDE shows why years of dependable protection are assured with an Allis-Chalmers DZ breaker. Within the rugged frame and tank are time-proved *Ruptor* interrupting devices—which have their contacts controlled by a mechanically trip-free solenoid-operating mechanism. *Ruptor* units provide long periods of continuous, trouble-free service because they offer:

SIMPLE DESIGN: Bayonet contacts (1) are the only moving parts.

EASY INSPECTION: Drop the tank, and the bayonet contacts are visible in open position. For access to the stationary contacts, remove four bolts and cylindrical shell (2).

DEPENDABLE OPERATION: Tulip and bayonet type contacts (3) are self-aligning and self-cleaning; they maintain high conductivity without readjustment. Efficient interruption on special arcing-alloy contacts within oil-filled *Ruptor* unit minimizes arc energy—contributing to long contact life and low oil deterioration.

Ruptor is an Allis-Chalmers trademark.

Allis-Chalmers circuit breakers are available in ratings from 2.5 to 230 kv, with interrupting capacities from 15,000 to 10,000,000 kva, to meet all industrial and power company requirements. For more information, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3825

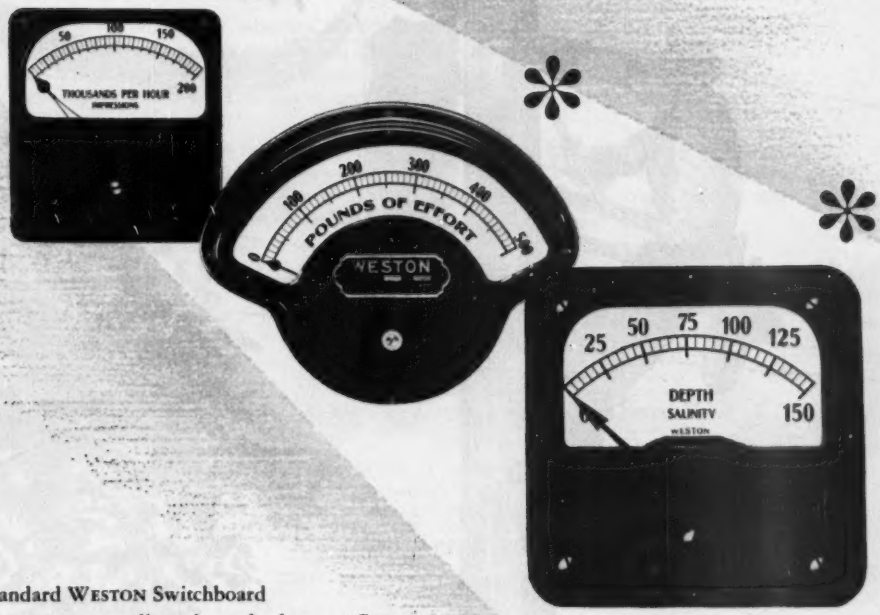
TYPE	RATED KV	MINIMUM KV AT RATED KVA	RATED AMPS	KVA INT. CAPACITY
DZ-408*	7.2	2.3	600	100,000
			1200	100,000
			2000	100,000
DZ-608†	13.8	4.0	600	150,000
			1200	150,000
DZ-1008†	13.8	4.0	1200	250,000
DZ-2008†	13.8	6.6	1200	500,000
			2000	500,000

*Ask for Bulletin 7186179.
†Ask for Bulletin 7186129.

ALLIS-CHALMERS

Electrical Protection *Depends* on Mechanical Perfection

*NOT Catalogued!



Standard WESTON Switchboard Instruments are all catalogued, of course. But these are *special* switchboard instruments . . . a few of the many hundreds of different types being constantly engineered and produced to meet specific requirements. Requirements such as . . . *special sensitivities —scale markings—pointer styles and response—mirror scales—adjustment to give maximum accuracy at critical points, etc.* Whatever your instrument requirement . . . *standard or special* . . . the answer is available here at *instrument headquarters.* WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAG instruments.

WESTON
798

SWITCHBOARD *Instruments*

Facts from
NEBRASKA

"'CSP®' Transformers cut installation costs up to $38 per unit"

"Our urban and close suburban distribution areas (outside the downtown network system) became seriously overloaded, and had to be converted to a higher voltage. Since much of it served desirable residential areas, we were anxious to obtain clean-looking pole tops. Therefore, we decided to use 'CSP' Transformers exclusively," says a Nebraska Utility.

"We realized savings in installation costs averaging $34.37 per unit. Since 650 transformers were involved, a total saving of approximately $22,340 was realized. In addition, we benefit by the greater protection against overloads and short circuits which is inherent with the 'CSP' Transformer and with the continuous load check provided by the signal light.

"We found the following comparison of costs:

Conventional Transformer		*'CSP' Transformer*	
Arrester installed	$29.00	Additional cost of "CSP" over the conventional transformer—includes built-in lightning and thermal protection plus load indicating light	$30.38
Cutout installed	25.00	Higher pole for secondary clearance (required in some instances)	2.00
Two 7-foot crossarms installed	14.00		
One 5-foot arm installed	2.50		
Total	**$70.50**	**Total**	**$32.38"**

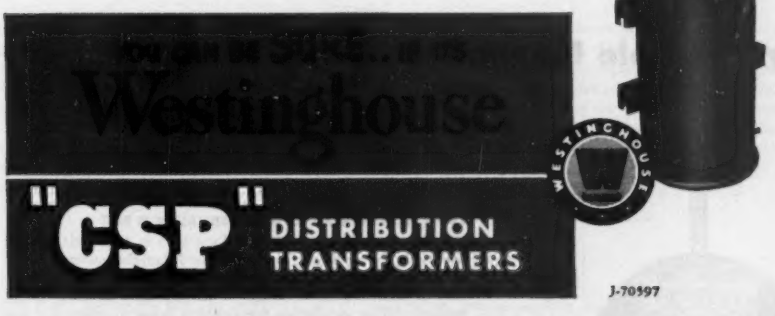
Installation and maintenance costs for "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

	"CSP"	*Conventional*
Installation Cost	**$13.87**	**$24.74**
Burn-out Rate	**0.257%**	**1.005%**
Fuse Outages	**None**	**5.64% @ $6.52 per outage**
Load Checks	**Automatic**	**12.8%**
Breaker Reset	**1.02%**	**None**

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices... originated and patented by Westinghouse

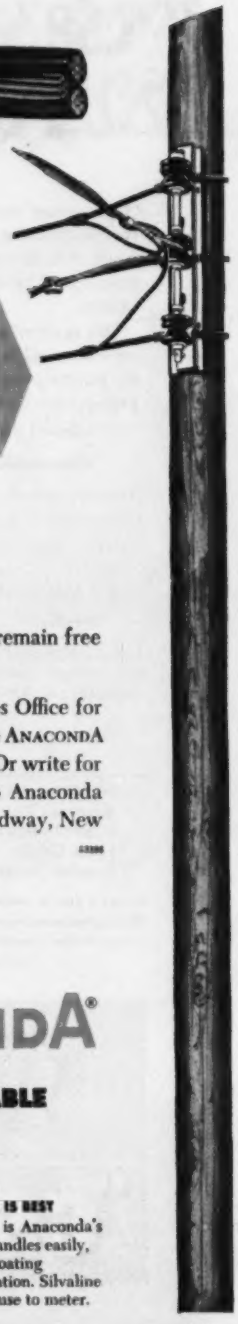


J-70597

ANACONDA Type N-SD

Service Drop Cable with copper or aluminum conductors

YOUR CHOICE OF INSULATIONS:
neoprene
polyethylene



costs **less**

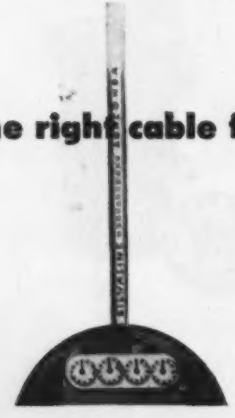
from pole

to weatherhead

TO HELP CUT THE COST of service connections, Anaconda now offers an outstanding service drop cable. It costs less . . . is highly dependable . . . durable . . . and extremely weather-resistant.

TWO INSULATED CONDUCTORS are wrapped around a bare neutral messenger so that the full support of the assembly is borne by the messenger wire. The conductors remain free of tension.

ASK YOUR NEAREST Anaconda Sales Office for full information on this up-to-date ANACONDA Type N-SD Service Drop Cable. Or write for descriptive Bulletin DM-5121 to Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



the right cable for the job ANACONDA®

WIRE AND CABLE

FROM WEATHERHEAD TO METER, SILVALINE IS BEST
Weatherproof Silvaline* (URC Type SE) is Anaconda's completely new service entrance cable. It handles easily, offers long service life, and its silver finish coating may be painted without danger of discoloration. Silvaline is approved for installation from pole to house to meter.
*Trademark

All three Boilers at New Titus Station of the Metropolitan Edison Company

equipped with LJUNGSTROM AIR PREHEATERS

Adding on completion 240,000 kilowatts to the output of the Metropolitan Edison Company of Reading, Pa., the company's new Titus Station is now in operation producing 160,000 kilowatts. Designed and constructed by Gilbert Associates, Inc., of Reading, Pa., Titus is expected to be in capacity operation early next year.

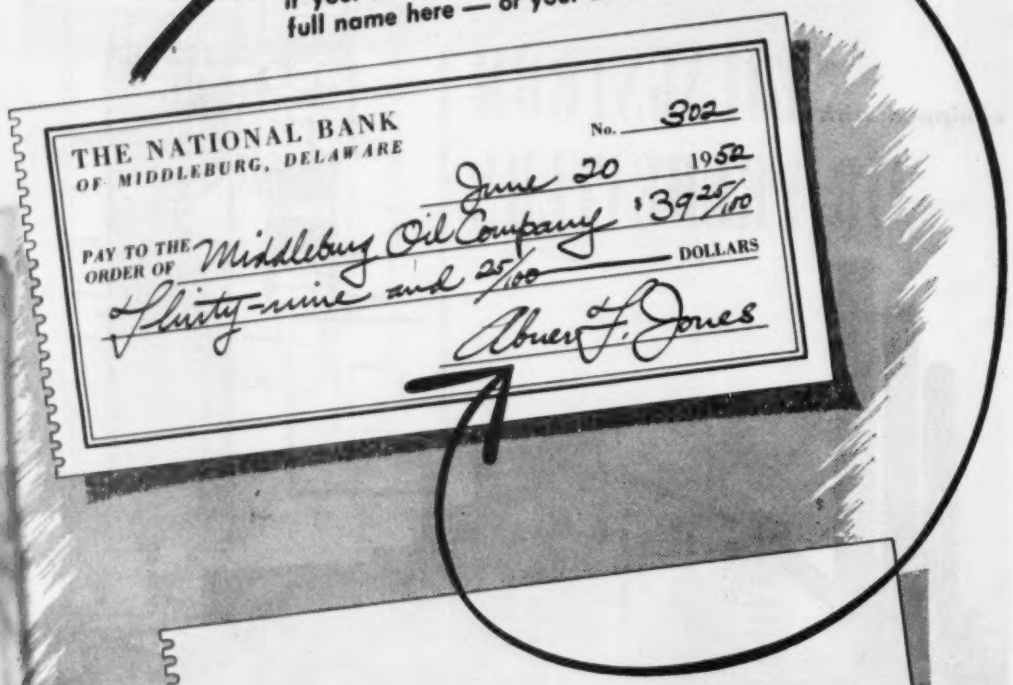
Steam for each of the two 80,000-kw turbine-generators now in service, and for the third, soon to go into service, is supplied by a Combustion Engineering–Superheater Boiler at 1450 psi and 1000 F, reheated to 1000 F. These C-E Boilers are pulverized coal fired.

Each Combustion Boiler has been designed to incorporate two Ljungstrom Air Preheaters which preheat incoming combustion air to 600 F, and cool exit gases to 280 F.

At Titus, as at scores of power plant installations across the country, once again the broad general acceptance of the Ljungstrom Air Preheater for top efficiency steam generating units is demonstrated. Ljungstroms placed in service or on order since 1945 alone — selected by every major boiler manufacturer, consulting engineer and utility — are serving boilers with an aggregate capacity of over 285,000,000 pounds of steam per hour.

THE Air Preheater Corporation 60 East 42nd St., New York 17, N. Y.

if your name is Abner F. Jones, sign your full name here — or your check is no good



when you write specifications — write them out in full to insure getting what you want . . .

Not mica but **MACALLEN MICA**

when you think of MICA . . . think of MACALLEN

MACALLEN MICA

ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

THE MACALLEN COMPANY

16 MACALLEN STREET • BOSTON 27, MASS.

CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE.

Meet **MAC GORDAN** of Baltimore. He's our Purchasing Agent. His job is to locate suppliers who can produce materials and parts suitable for use in making Locke Insulators. He also sees to it that these suppliers come through with products which meet Locke's manufacturing standards. "You'd be surprised," remarked Mac, "how tough it is for us to find suppliers who produce materials and parts which come up to our 'specs'. It looks to me as if Locke has the highest, most rigid quality standards in the industry." We asked Mac to prove his point. He came up with three good examples. Here's the story, as he told it to us.

Here's why Mac Gordan pays premium prices for parts and materials used in making

LOCKE

Suspension Insulators

"Suppliers," says Mac, "simply can't meet our specifications with ordinary parts and materials."

"For example, take the case of our No. 1840 High Voltage Suspension, shown on this page. Our specification calls for forged steel ball bolts. These ball bolts must have ductility enough to neck-down before they break in a destructive pull test. They must also be capable of taking a 30° bend over a ⅛" radius in the neck area without breaking. This guarantees uniformly good tensile strength in the finished insulator. Suppliers had great difficulty meeting this unusual 'spec' with their generally accepted bolts. To give us the extra quality we demand, suppliers therefore charge us a premium price amounting to thousands of dollars extra a year. We absorb these extra costs, because we feel that our customers deserve this added assurance of trouble-free service."

On the next page Mac cites two more examples of Locke's use of premium parts in making insulators which give you premium performance ----

"The premium parts used in making our Suspensions are the best protection we can offer our customers," says Mac Gordan. "They want trouble-free service...we try to give it to them."

"A case in point," says Mac, "is this 6 inch dead-end. We had an opportunity to buy caps for this insulator for much less than we'd been paying. In checking, we found tiny cracks developing in the castings of these cheaper caps. We were told these shrink cracks were inevitable and wouldn't weaken the casting. But rather than lower our standards, and take a chance on quality, we decided to pass up this cheaper cap. We now use a premium-priced cap which costs us thousands of dollars a year extra. We absorb this cost because it gives customers the extra quality they expect in Locke 6-inch discs."

"Take this 25,000 pound Suspension," Mac continues. "Here's another case of 'what's good enough for others, often isn't good enough for us'. We wanted a new cap for this insulator. One supplier quoted a price 25 cents less than the usual price. Again, this cheaper cap was apparently well-accepted. In checking, we found lumps inside the casting, which though invisible, would tend to weaken the insulator assembly. What's more, the castings would not pass our gage for cotter key hole, roundness of lip diameter, and inside height and profile. The cap was obviously inferior. We're now paying 25 cents per insulator more than the average for this cap. This is just another good example of how we protect our customers at all times by using premium parts and materials."

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Md.

LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

GUY INSULATORS

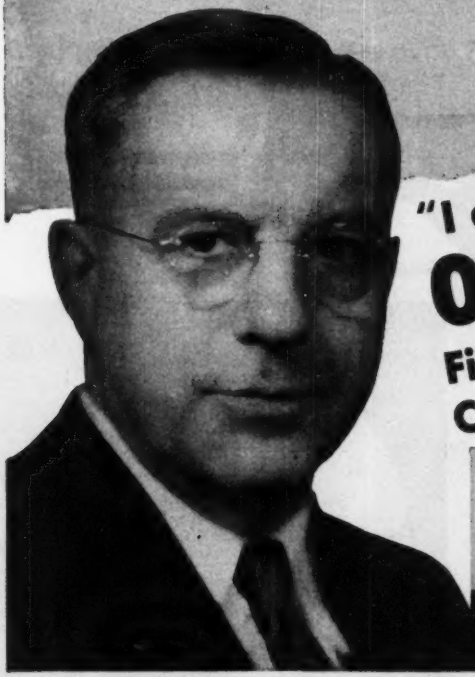
LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

ENTRANCE BUSHINGS

1. Lasts indefinitely.
2. Impermeable wall and tight joints prevent corrosive ground waters from entering.
3. Light, easy to handle and tool on the job.
4. Low coefficient of friction keeps pulling tensions on cable to minimum.
5. Resists acids, alkalis, salt, grease, oil.
6. Lays faster and at lower cost than any other type of conduit.



"I always specify ORANGEBURG® Fibre Conduit for Complete Cable Protection" says the Utility Engineer

Orangeburg is a leader in every city and state. Men responsible for protecting electric cables know they can rely on Orangeburg Fibre Conduit, a favorite for over 58 years.

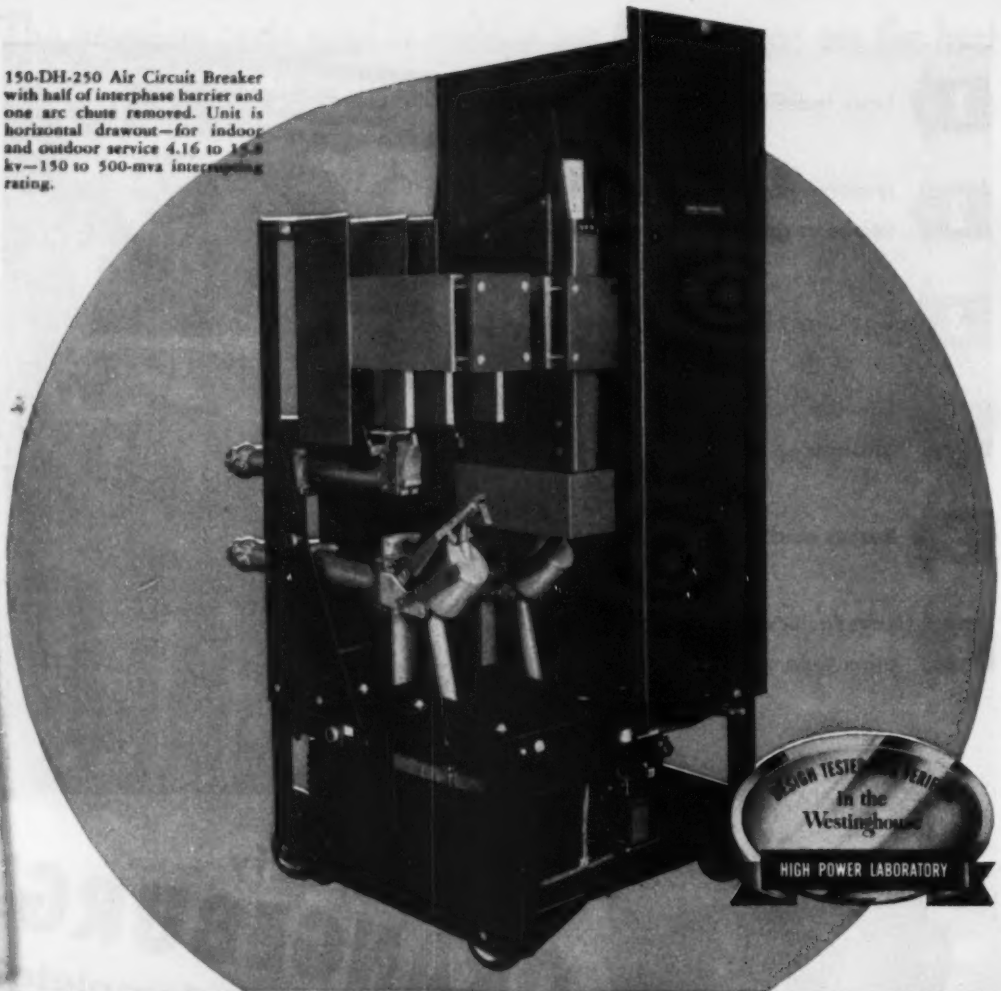
Orangeburg Manufacturing Co., Inc.
Orangeburg, N. Y.

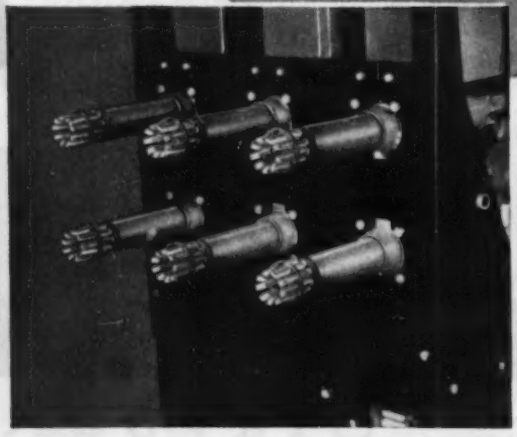
GENERAL ELECTRIC SUPPLY CORPORATION

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT
BRANCHES AND STOCKS IN PRINCIPAL CITIES

GraybaR ELECTRIC COMPANY

150-DH-250 Air Circuit Breaker with half of interphase barrier and one arc chute removed. Unit is horizontal drawout—for indoor and outdoor service 4.16 to 15.0 kv—150 to 500-mva interrupting rating.





Positive contact is obtained on primary disconnects by individual flat springs and heavily silvered, self-aligning, finger-like segments. Segments on breaker are easy to inspect.

Horizontal-drawout feature makes it easy to place breaker into operation. Two-surface wheels which ride on track in stationary structure assure perfect alignment for engaging contacts.

The DH De-ion® breaker design pays performance benefits

IN EVERY PHASE OF METAL-CLAD SWITCHGEAR OPERATION!

Here's how the Westinghouse DH Air Circuit Breaker for Metal-Clad Switchgear gives you the kind of performance you want . . .

Fast, positive, arc interruption . . . DH Air Circuit Breakers employ the De-ion® principle of arc interruption—the most efficient method of arc extinction in use today. The De-ion principle is a Westinghouse exclusive! The true ceramic material used in constructing the arc chutes provides unusually high resistance to heat shock.

Simple, effortless operation . . . DH Breakers are the horizontal-drawout type. No lowering or lifting is necessary. There's no complicated mechanism to require frequent inspection or maintenance. Breakers are drawn straight out from disconnected position . . . require only a few easy turns of a crank to move into operating position.

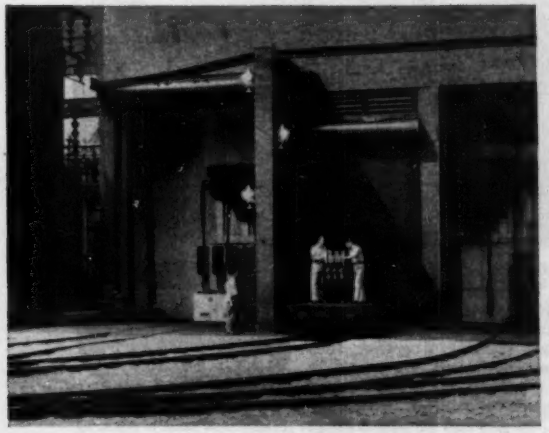
Easy inspection and maintenance . . . Breaker interphase barriers can be removed by simply loosening holding bolts. Arc chute removal—just as simple—exposes contacts at an accessible and convenient working height for quick inspection and maintenance. High-pressure, finger segments located on breaker primary disconnects further simplify maintenance.

"Long-life" construction . . . All breaker elements are secured to a rigid, all-welded steel frame. Hardened, stainless steel is used at major wearing points . . . silver-tungsten arcing contacts have high resistance to arc burning.

Perfect alignment for interchangeability . . . The use of a master breaker and a master stationary structure in manufacturing holds drawout units and stationary structures to close dimensional tolerances. Result is perfect alignment . . . easy interchangeability.

Proved operation . . . The DH Air Circuit Breaker design has been extensively tested in the Westinghouse High Power Laboratory. The results of these tests are verified by many years of satisfactory field performance on thousands of breakers.

For complete information on Westinghouse Metal-Clad Switchgear write for Booklet B-5306. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60795



A DH Air Circuit Breaker is brought into a test cell in the Westinghouse High Power Laboratory to verify a new design feature under short-circuit conditions.

See "Electrical Proving Ground"

. . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details see your Westinghouse representative, or write: Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania.

ELECTRICAL PROVING GROUND

YOU CAN BE SURE . . . IF IT'S

Westinghouse

METAL-CLAD SWITCHGEAR

1
Three layers of "Scotch" Electrical Tape No. 22, half-lapped, form tough foundation layer on 2,000,000 CM cable
SCOTCH
Electrical Tape

TAPE takes over when insulation fails . . .

and saves huge cables from scrap heap!

WHEN HIGH OPERATING heat caused insulation failure on 2,000,000 CM cables, this large western public utility turned to tape—"Scotch" Electrical Tape—to solve the problem.

And they found just what they wanted: first, a tough, flexible tape for a first wrap; next, a glass-cloth tape with thermosetting adhesive for high heat resistance; then, an extra-heavy plastic tape to protect the cables from mechanical damage. Together, these three tapes saved the company hundreds of dollars in replacement costs.

"Scotch" Electrical Tapes may be the answer to one of *your* insulating problems, too. Write today outlining your requirements. No charge or obligation, of course.

SCOTCH BRAND ELECTRICAL TAPES

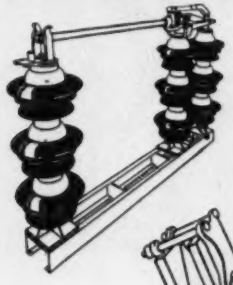
3M

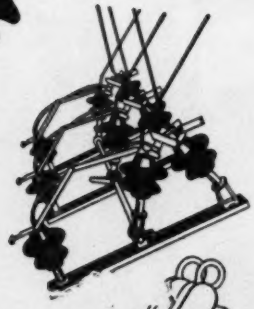
The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Undercoat" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

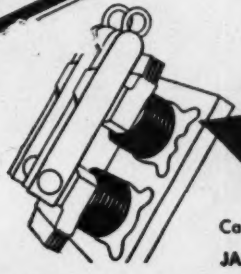
FOR DEPENDABLE TROUBLE-FREE PERFORMANCE

Install ELPECO

POWER SWITCHING EQUIPMENT







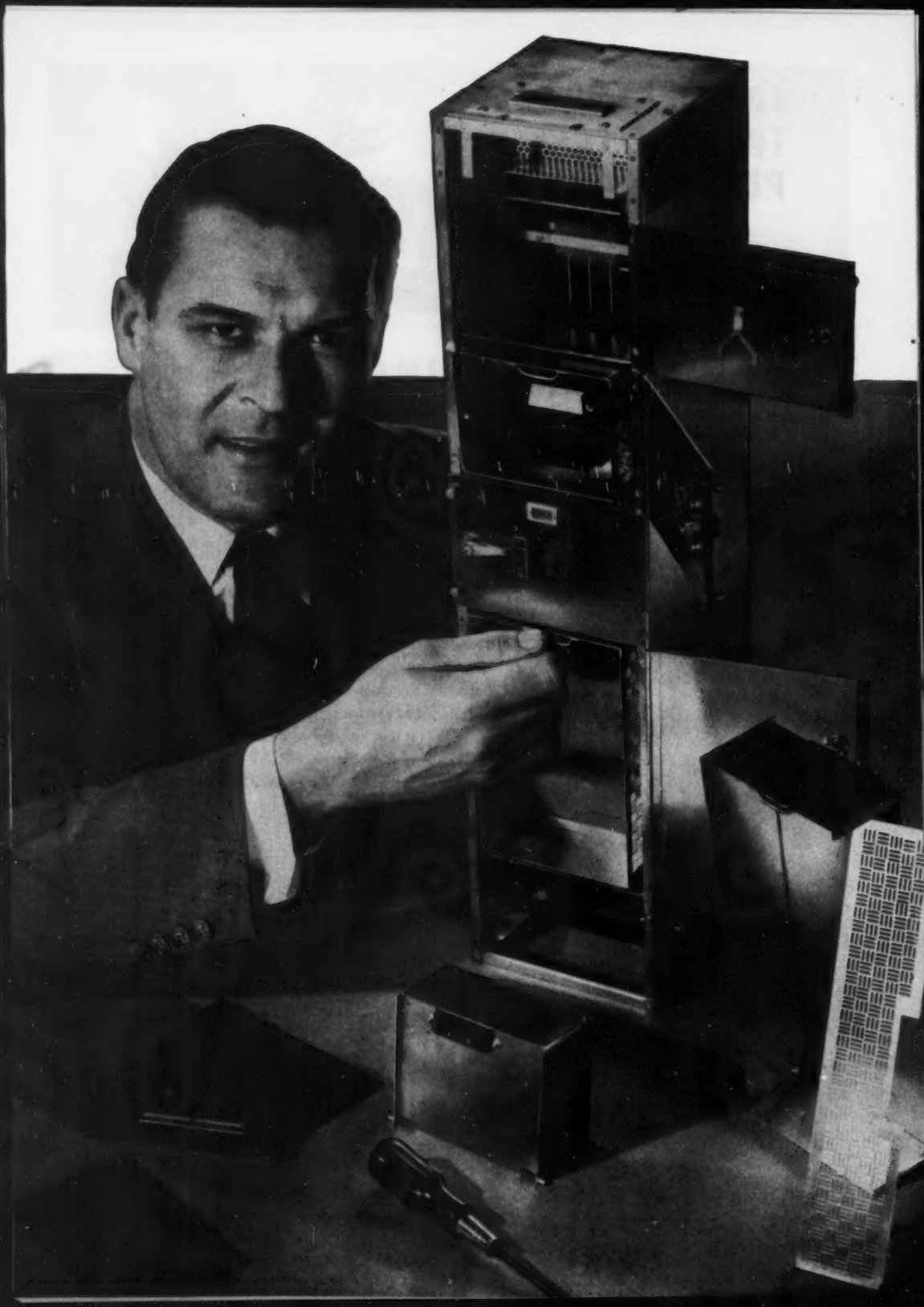
For over 40 years the Elpeco line of high-quality power switching equipment has been known for its outstandingly dependable and trouble-free performance. Constant research and redesign have enabled Elpeco to *anticipate* rather than meet the ever changing demands and requirements of the electrical industry. Particular buyers, who have specified Elpeco products over the years, know that when they buy Elpeco Indoor and Outdoor Disconnect Switches, Air Break Switches, Indoor and Outdoor Bus Supports, Bus Ducts and Substations . . . they are getting the finest, most modern equipment on the market. All Elpeco products conform to NEMA and AIEE standards for performance.

A new series of bulletins, completely illustrating and describing each item in the Elpeco line is now available. Let us know the particular type of equipment in which you are interested. We'll be glad to send the appropriate bulletins by return mail.

ELPECO

DIVISION OF ROLLER-SMITH CORP.
BETHLEHEM, PENNA.

Canadian Affiliate:
JAMES R. KEARNEY CORP. of Canada, Limited, Guelph, Ontario



Here's why most control center buyers specify Westinghouse

Why this mass preference? It all boils down to matching product to need. Close co-operation with industry, exhaustive tests and constant improvement have produced this control center which matches industry's every need. Here are the product features that make Westinghouse Control Centers the MOST PREFERRED control centers:

FLEXIBILITY

Westinghouse Control Centers have complete flexibility to match the periodic movement, substitution and addition of machines—flexibility of electrical components—flexibility of structural units. All cubicle units are built to a standard 14″ module—are completely interchangeable. Vertical structures are standardized and free-standing—can be moved or added at any time.

EASIER SERVICING

There is no maze of mechanical obstacles on a Westinghouse Control Center. A few twists of a screw driver and your serviceman is ready to go to work. Guide rails simplify removal and insertion of cubicles. All starter units are front wired. Side baffles are removable for easier wiring. Sectional and master terminal boards speed hook-up work.

POSITIVE SAFETY

Westinghouse Control Centers protect *both* personnel and equipment. The Westinghouse "Magnagrip®" stab connectors and tilt-out disconnect position assure a "dead" unit for servicing. Unit door remains on structure to cover hot buses when starter unit is removed. Tested baffling prevents explosive chain reactions if faults occur. Each starter has an interrupting capacity of not less than 15,000 rms amps.

Complete details on these and other important features are contained in the Control Center Booklet B-4213. Ask for your free copy. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27021

YOU CAN BE SURE...IF IT'S
Westinghouse
CONTROL CENTERS

How to be Sure You Don't get "SHORT-CHANGED"

...NEXT TIME YOU BUY TAPE!

While minimum length can be depended on to be accurate in any roll of tape, it's the *weight* of the roll that you must watch. It is important for you to know: Does the No. 4 Roll actually weigh 4 ounces, as it should; and the No. 8 Roll 8 ounces?

For weight reveals whether tape is full strength in substance, or whether its protective and adhesive properties have been weakened due to skimpy materials. Underweight tape means you must use more of it, and take the extra time to roll more on, when a job requires maximum tape protection.

You can always weigh every roll you buy, of course, but why bother, when HAARTZ-MASON publicly makes you a DUAL GUARANTEE — a guarantee covering both weight and length, and prints this information boldly on every roll and container.

So get full measure the next time you buy tape by accepting none but the DUAL GUARANTEED HAARTZ-MASON brands.

Haartz-Mason, Inc.

WATERTOWN 72, MASSACHUSETTS

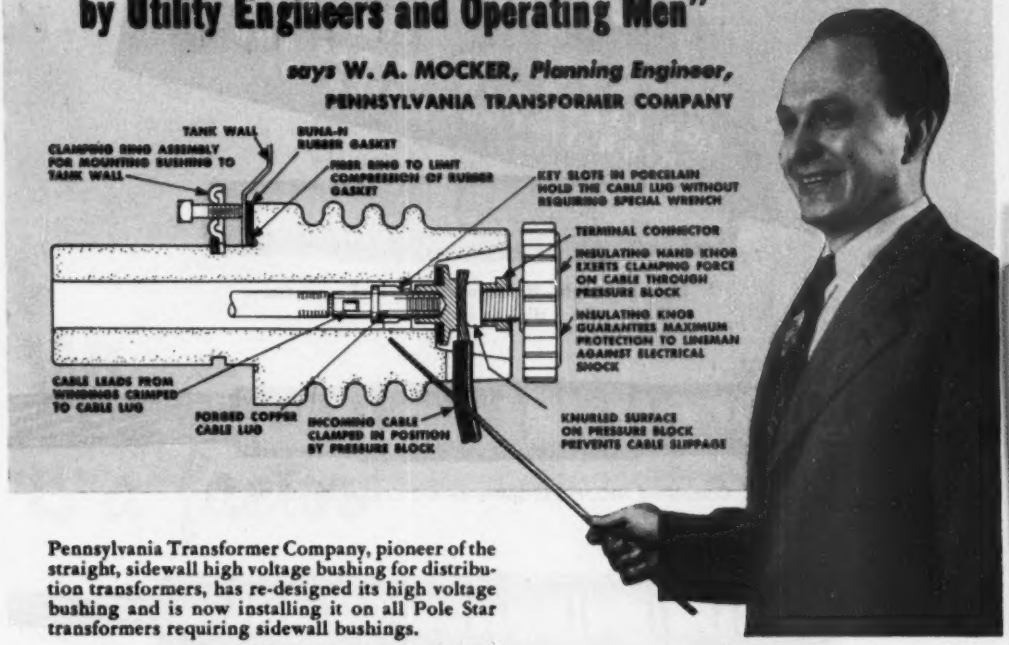
PARAPLASTIC Plastic Tape that does the work of both rubber and friction.

Note: Weight and length information are printed boldly on every roll and container.

Emblem of BUSINESS CHARACTER
Rice Leaders of the World Association

"Our New POLE STAR HIGH VOLTAGE BUSHING has every Mechanical and Electrical Feature desired by Utility Engineers and Operating Men"

says W. A. MOCKER, *Planning Engineer,*
PENNSYLVANIA TRANSFORMER COMPANY


TANK WALL
BUNA-N RUBBER GASKET
CLAMPING RING ASSEMBLY FOR MOUNTING BUSHING TO TANK WALL
FIBER RING TO LIMIT COMPRESSION OF RUBBER GASKET
KEY SLOTS IN PORCELAIN HOLD THE CABLE LUG WITHOUT REQUIRING SPECIAL WRENCH
TERMINAL CONNECTOR
INSULATING HAND KNOB EXERTS CLAMPING FORCE ON CABLE THROUGH PRESSURE BLOCK
INSULATING KNOB GUARANTEES MAXIMUM PROTECTION TO LINEMAN AGAINST ELECTRICAL SHOCK
CABLE LEADS FROM WINDINGS CRIMPED TO CABLE LUG
FORGED COPPER CABLE LUG
INCOMING CABLE CLAMPED IN POSITION BY PRESSURE BLOCK
KNURLED SURFACE ON PRESSURE BLOCK PREVENTS CABLE SLIPPAGE

Pennsylvania Transformer Company, pioneer of the straight, sidewall high voltage bushing for distribution transformers, has re-designed its high voltage bushing and is now installing it on all Pole Star transformers requiring sidewall bushings.

ELECTRICALLY CO-ORDINATED

The Basic Impulse Level of the bushing is co-ordinated with the transformer windings. When the transformer is subjected to a voltage surge above the BIL of the bushing, the bushing will flashover on the outside. A separate, completely co-ordinated bushing is available for each voltage class—5 Kv and 8.6 Kv.

MECHANICALLY IMPROVED

The new Pole Star bushing is extra strong and extra safe. No tools are needed to make a line connection. *You simply insert the incoming cable through the side opening and turn the handle.* This tightens the pressure block against the cable and holds the cable in a vice-like grip to make an excellent electrical and mechanical connection. The corrugated, easy-to-grip knob is constructed of a phenolic rubber compound and will not break to expose live parts, or chip to cut a lineman's glove.

Let the POLE Star be your guide

Product Of Long Experience

Safe Thrifty And Reliable

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • ***Greater Pittsburgh District***

Nicopress

FOR LARGE CONDUCTORS AND HIGH-STRENGTH STRANDS

**Light in weight—Holds full strength of conductor—
High in conductivity**

Completed NICOPRESS Splice on 4/0 Copper Conductor

**Completed NICOPRESS Splice on 3/8" Extra High Strength
Copperweld Strand**

**Completed NICOPRESS Splice on 3/8" Extra High Strength
Galvanized Steel Strand**

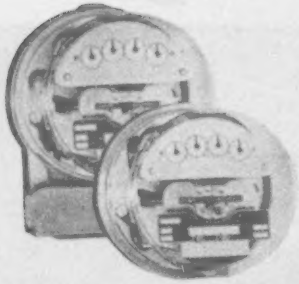
Nicopress is the Registered Trade Mark of The National Telephone Supply Company

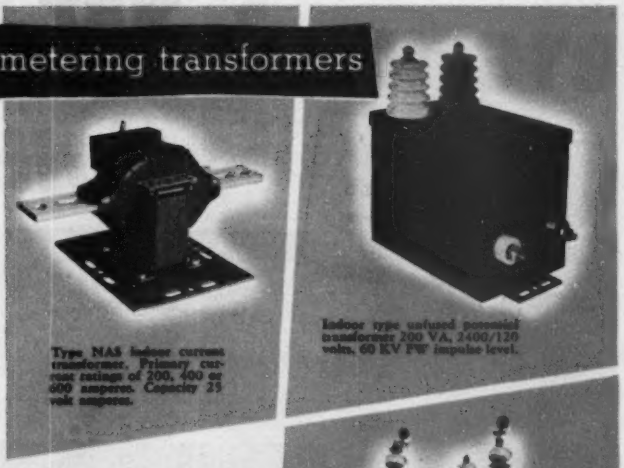
THE NATIONAL TELEPHONE SUPPLY COMPANY

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

current, potential and metering transformers





Type NAS indoor current transformer. Primary current ratings of 200, 400 or 600 amperes. Capacity 25 volt amperes.

Indoor type unfused potential transformer 200 VA, 2400/120 volts, 60 KV FW impulse level.

Outdoor metering set for 69 KV consisting of current and potential elements, oil immersed.

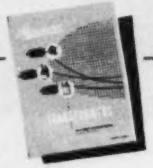
When accuracy is a factor

In the field of measurement for precision metering, operation of indicating instruments, relays and control apparatus, there is no substitute for accuracy.

The Standard Transformer Company has designed and is manufacturing a complete line of accurate current and potential transformers for every application... current, potential and metering transformers for any voltage up to and including 72 KV, and at any specified frequency. All thermal and mechanical ratings in accordance with industry's requirements and standards for each specific use. All standards set by ASA and EEI-NEMA in respect to accuracy are met.

Many prominent manufacturers of switchgear and control apparatus are regular users of STANDARD current and potential transformers. Our production facilities are flexible and engineering skill versatile enough to produce quickly transformers of special design to meet your specifications. Call in your STANDARD representative for further information.

everything points to



WRITE FOR BULLETIN S-501-B

32 pages of detailed drawings, accuracy limits, ratio and phase angle curves for current, potential and metering transformers. Write for your copy today.

Standard

THE STANDARD TRANSFORMER COMPANY

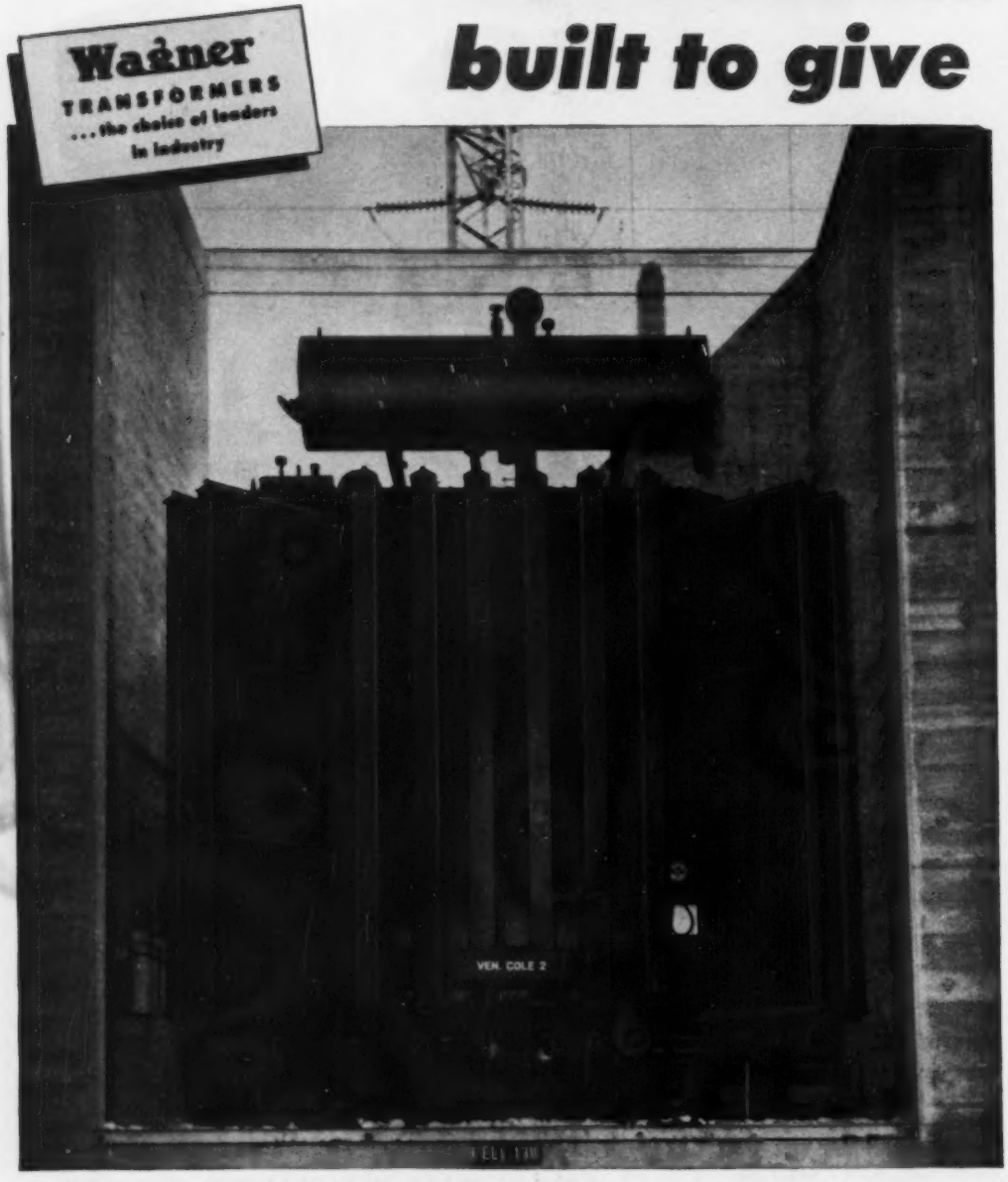
Trade Mark ®

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

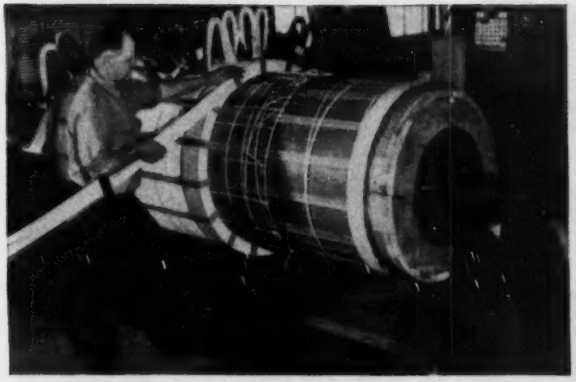
Wagner

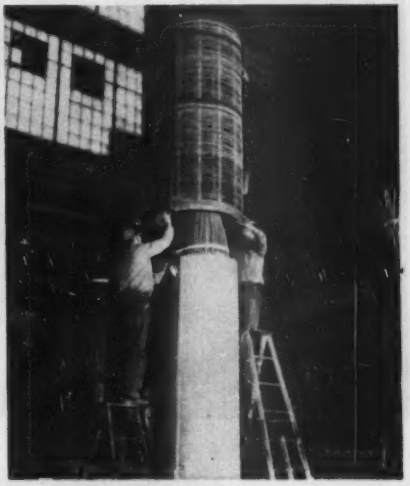
built to give

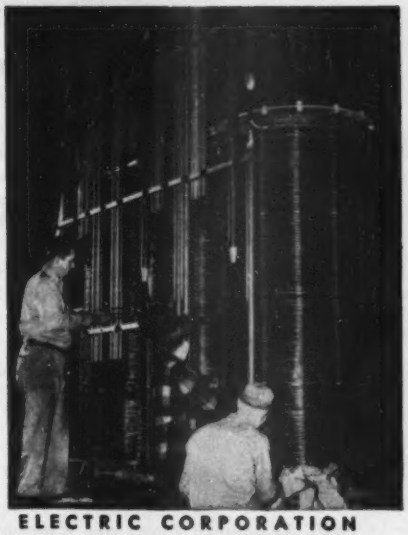


This oil-filled, forced-air cooled Wagner Power Transformer, rated 15000/20000 kva, is one of many installed at the Venice, Illinois plant of the Union Electric Company of Missouri.

Power Transformers
longer service life...







Wagner Power Transformers have been serving the power industry dependably for over sixty years. Service records from the field, dating back to the early days prove their ability to give continuous service over unusually long periods of time. They are compact in design and are built with painstaking care to give them inherent strength and stability. They have sufficient capacity to not only carry their normal load, but to be able to handle overloads—again and again—whenever emergencies arise.

Every step in the construction of Wagner Power Transformers is attentively controlled. Three steps are shown here. Highly skilled workers wind a low voltage coil, carefully place a high voltage stack into position, and make the final connections on a core and coil assembly.

Users of power transformers will find it profitable to consult Wagner engineers on their next transformer installation. Thirty-two branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Avenue • St. Louis 14, Mo., U. S. A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

Sangamo J Meters

preferred by men who work with meters

Your meter superintendent and his men prefer meters that can be quickly and easily calibrated, saving costly man-hours for his company.

Men who work with meters *know*, that Sangamo J Meters, as received, seldom need any calibration to meet all generally accepted standards of accuracy.

Simple full-load and light-load adjustments—readily accessible from the front, exceptionally clear visibility, and easy removal of registers, are a few of the reasons why J Meters are favorites with meter testers everywhere! They're faster to test—easier to calibrate. An ordinary screwdriver is the only tool needed.

Economical replacement of parts is another of the reasons why the men who work with meters prefer J Meters. When advantageous, either the current or potential element may be replaced separately.

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

new

NEW

new...

ask for your Copy

This new Bulletin not only tells why Preformed Dead-Ends are more efficient and more economical, but also details how they develop the full strength of all grades of strand and conductor *without* any concentrated pressures that could cause conductor deformation . . . of particular importance with all-aluminum conductors.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE
CLEVELAND 3, OHIO

Preformed Line Products Company
5349-A St. Clair Ave., Cleveland 3, Ohio.

Please send me your new Bulletin 35-200

Name_____

Company_____

Address_____

_____

G-E CIVIL DEFENSE FILM AWARDED FREEDOMS FOUNDATION PUBLIC SERVICE MEDAL

Outstanding public service release currently available for civic and industrial showings

MORE than 10 million people have seen General Electric's civil defense film showing how a city prepares its communications network for vital disaster service. A dramatic documentary, the 22-minute motion picture stresses the role of communications in everyday life, depicts an atomic blast over Syracuse, N. Y. and demonstrates how the existing communication systems of a city and a county can be coordinated in an emergency. The film is a part of the nation-wide Communications Advisory Service, a G-E organization of electronics engineers whose consultation services are available to communities and industries of every size.

One of the most popular films in G-E history, "Voice" is being sponsored by civic and industrial groups across the nation to stimulate public interest in civil defense. If you want it for your community at only nominal cost for mailing, call the CAS* man at the G-E office near you, or write us. *General Electric Company, Section 1982-25, Electronics Park, Syracuse, New York.*

*Communications Advisory Service

Freedoms Foundation president Kenneth D. Wells, presents award scroll to Roy D. Jordan (center), secretary of G.E.'s Electronics Division CD Committee, and Neal F. Harmon, G.E.'s CD Coordinator.

The film shows evacuation of residents from the city by taxicab after the atom "blast" plus many other eye-opening scenes. Will your city be prepared? Be sure to see this timely civil defense film.

Lt. General Willis Crittenberger, commanding First Army, with G.E. Vice-President W. R. G. Baker on nationwide TV showing of film. More than 30 TV stations have screened the picture as a public service.

GENERAL ELECTRIC

American Blower . . . a time-honored name in air handling

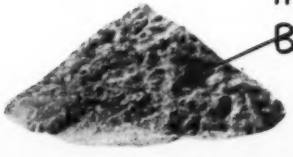
This is simple.
It filters the sludge
out of the oil
in your car.

BREECHING TO INDUCED DRAFT FAN
PRIMARY CONCENTRATOR
BREECHING FROM BOILER OR AIR HEATER
SECONDARY VENT FAN
SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

NOTE: ST Precipitators are also available for stoker-fired boilers with or without a secondary system.

This is simple.
It collects the fly ash
from a pulverized fuel-
fired boiler in your
power plant.

In this instance, too, a suprising amount of objectionable material is collected in a proved, practical manner. Investigate American Blower Type ST Precipitator, now!



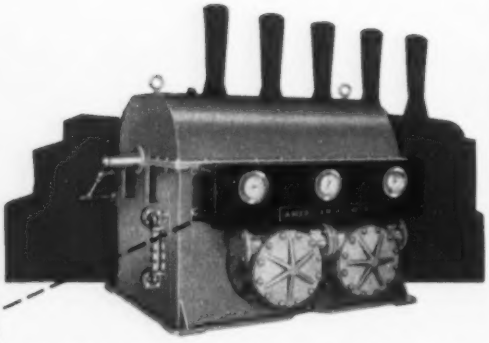
AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

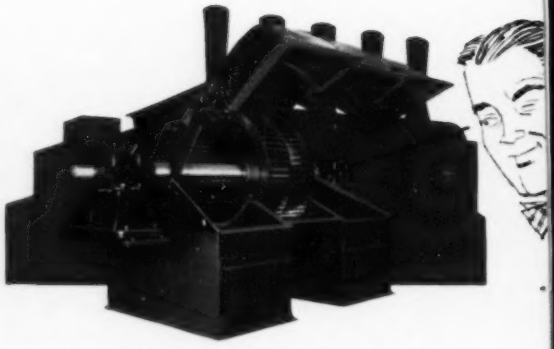
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

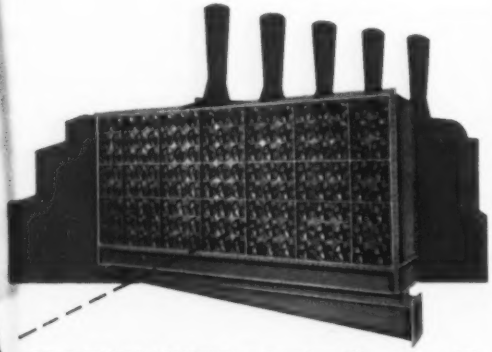
It all depends on how you look at it



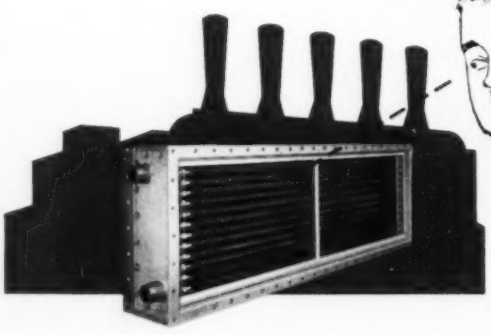
TO A CONTROL MAN this American Blower Class 6 Gyrol Fluid Drive, for flexible control of boiler feed pumps, looms up as big as this in relation to a power plant. He sees, too, American Blower Class 4 Fluid Drive for fan control.



TO A MECHANICAL DRAFT MAN a Sirocco Multi-Blade Fan, which delivers more gas per revolution than any other type, takes *this* proportion in the picture. He could see an American Blower HS Fan equally large if thinking of forced draft.



TO A FLY ASH EXPERT an American Blower Type ST Fly Ash Precipitator looks like this in relation to the rest of the power plant. Little wonder, for the Precipitator lifts a load off his shoulders and minimizes a nuisance.



TO A COIL MAN American Blower Heavy Duty Steam Coils would appear like this in his power plant picture. He likes their great strength, easy accessibility and the way they withstand the high pressures of heavy loads.

Looking at your complete power plant picture, we believe you'll find, as hundreds of others have, that all these American Blower Products improve over-all power-plant efficiency and insure years of dependable operation. Call our nearest Branch Office for complete data.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

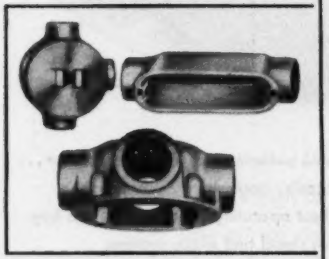
(Advertisement)

Electrical Applications of Aluminum

Stronger Splices and Deadends

Splices and deadends fabricated from aluminum tubing have proved highly successful for withstanding high pressures and heavy loads in widespread field applications. In addition to meeting the rigid strength requirements, aluminum is meeting with high favor in these electrical uses because of its corrosion resistant qualities, its workability before heat treating and its low cost. Thus aluminum has proved thoroughly satisfactory in both serviceability and in production economics. Snub-type deadends for *ACSR*, hot line clamps, tap clamps and split bolt type connectors are similar electrical applications that utilize the benefits of aluminum sheet, tubing, castings and extrusions.

Efficient Electrical Fittings and Fixtures



Many thousands of different types, sizes and shapes of die-cast aluminum electrical fittings and fixtures are in wide use today. One important reason for this popularity of aluminum is its weight. Aluminum fittings are light, easy to handle and costs less to ship and deliver to the job . . . yet are strong enough to withstand shock and strain far beyond actual job requirements. Aluminum is also rustproof and weatherproof and is highly resistant to chemical corrosion. The smooth satin finish inside and out of aluminum fittings protects fingers during installation and protects insulation on wire. Perfect uniformity in die-cast fittings and fixtures is easily obtained which makes installation easier, cuts costs and speeds up work. Write to Reynolds for details on these and any other electrical aluminum applications.

Make Important

✓OFFICE SAVINGS
✓FIELD SAVINGS
with Reynolds ACSR

Your *first* saving comes when you put through a Purchase Order for Reynolds ACSR. You'll find the original cost of this steel reinforced aluminum cable considerably less than other types of cable.

Saving number *two* comes in lower handling costs —ACSR's light weight slices dollars off freight car-to-storage-to-job-site charges.

Lower field costs give you saving number *three*. ACSR is faster, easier to string. ACSR is light yet strong—you can go to longer distances between poles—save up to four poles per mile. Or, because there is less sag to ACSR—you can use shorter poles or towers.

Figure out *your* potential savings. Then take advantage of them and specify Reynolds ACSR. Sooner or later you'll use aluminum—why not now? *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.*

FREE . . . ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

NOW . . . 4 Reynolds Master Reels do the work of 100 wooden reels! Handle ACSR quicker and more economically. Eliminate reel inventory and exchange. Cut down on handling, storing, record-keeping as well as reducing damage cost to a minimum. Reynolds Master Reels and Coils are easily assembled by linemen right on the job . . . are sturdier than wooden reels.

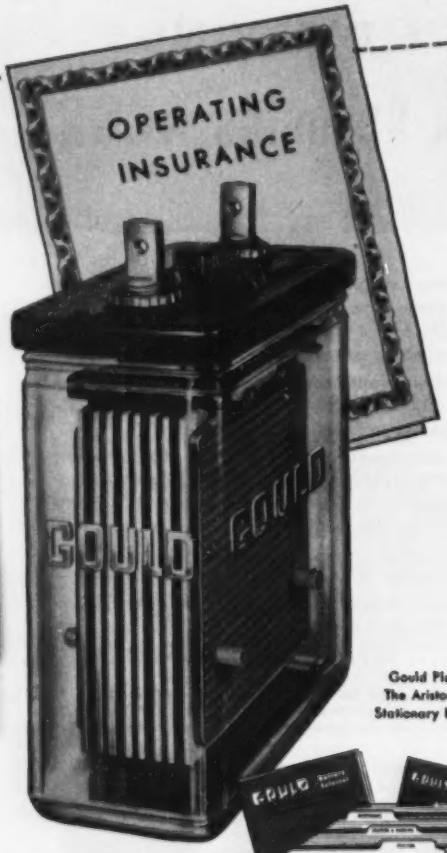
For complete information

see your Reynolds distributors listed below or write direct to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.

Westinghouse Electric Supply Co., New York, New York (And branches) • North Coast Electric Co., Seattle, Washington • Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS ALUMINUM

"Best Operating Insurance Money Can Buy!"



Gould Planté—
The Aristocrat of
Stationary Batteries

You may be able to save up to 50% on maintenance costs throughout the life of your stationary batteries by using the Gould Plus-Performance Plan. Write Gould Battery Information Headquarters for full details.

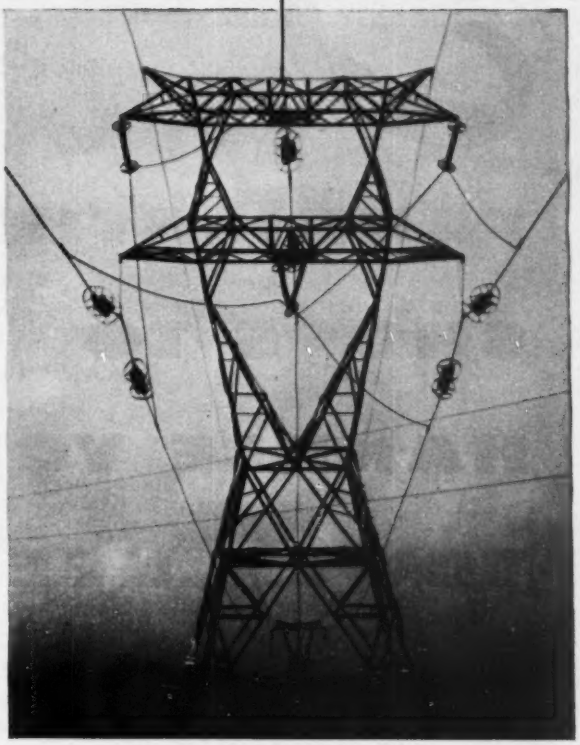
Because Planté batteries practically last forever . . . providing standby power that never fails . . . they're the best operating insurance you can buy. In switchgear, signal and alarm systems, or emergency light and power applications, these *pure lead* batteries have rolled up amazing performance records . . . are famous for their ability to deliver a powerful surge or a steady flow of current the instant it's needed. Make sure you're in operation . . . always. Choose Gould Planté.

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

Right Down the Line



With our Tower Department, "Right down the line" means—be *right* every step of the way from specifications, design and fabrication, to hot-dip galvanizing. It may take many years for such thoroughness to prove its value. But the longer it takes the less Blaw-Knox Towers cost you in the end . . . and *no* more at first!

BLAW-KNOX
TRANSMISSION TOWERS

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY
2013 FARMERS BANK BUILDING, PITTSBURGH 22, PA.

FABRICATING SHOPS TO HANDLE YOUR TOWER NEEDS

In order to handle your transmission tower requirements efficiently, Bethlehem offers the services of three well-located fabricating shops—at Seattle, Wash., South San Francisco, Calif., and Leetsdale, Pa.

Each of these large shops is set up for quantity production, if required, and has complete facilities for every phase of tower fabrication, including galvanizing. In addition, our engineering staff has long experience in handling every kind of tower problem and is equipped to design single- or double-circuit towers for any terrain, and for any load condition.

If you'd like to discuss transmission towers with a Bethlehem representative, drop a line to the nearest Bethlehem office.

BETHLEHEM STEEL

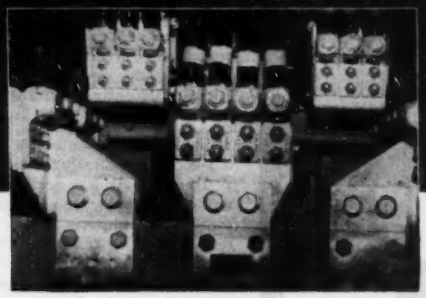
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast the fabrication of transmission towers is handled by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

Transmission Towers

proud to be aboard!

S.S. UNITED STATES



QIKLUG

Operation of the *S. S. United States*, new speed queen of the Atlantic, depends on an electrical system vast enough to serve a city the size of Toledo. In this floating city, unfailing performance of *electrical connectors* is, of course, vitally important. Hundreds of *standard* Burndy Qiklugs were specified for the electrical control circuits which help make the *S. S. United States* the safest, fastest liner afloat. These connectors are the same *standard* Qiklugs you can always procure easily whenever you are required to do an important electrical job *better*.

BURNDY

BURNDY ENGINEERING COMPANY INC.,
NORWALK, CONNECT.

BURNDY CANADA LTD.,
TORONTO 8, ONT.

52-31

When James R. Kearney Corporation planned its unique substation, near St. Louis, Missouri, penta preservative was specified for the wood employed. The Kearney substation, which takes its power from Union Electric Company of Missouri lines, is the only one of its kind in the world. Actually, it is a piece of laboratory equipment used to test fuse-protective devices rated up to 69,000 volts and 100 amperes.

Monsanto Penta protects unique substation

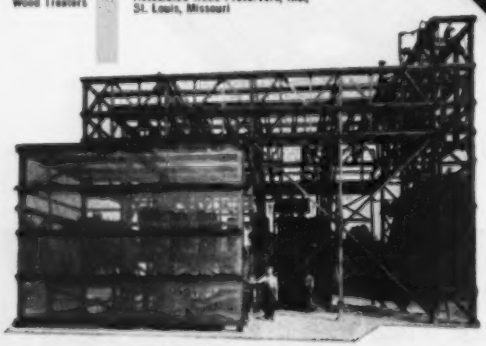
Monsanto Penta was applied in solution by pressure so that wood retained 6 pounds per cubic foot. Fourteen thousand four hundred and ninety-nine board feet of laminated lumber were treated. The Kearney Corporation selected penta preservative because Kearney executives consider penta a standard of the electrical industry.

Monsanto Penta is a stable chemical developed specifically for wood preservation. It does not leach. Rain and ground water cannot wash it away. Penta protects against termites and other wood-boring insects. It prevents decay. It can be formulated into clean treatments that leave wood paintable.

Contact the nearest Monsanto Sales Office or write for further information on the use of penta to preserve wood in substations, transformer platforms, poles, crossarms or construction. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

Engineering	James R. Kearney Corporation, St. Louis, Missouri
Builder	Frain-Colnon Contracting Company, St. Louis, Missouri
Laminated Wood	Rilco Laminated Products Company, Albert Lea, Minn.
Wood Treaters	Associated Wood-Preservers, Inc., St. Louis, Missouri



James R. Kearney Corporation substation, near St. Louis, was visited by many electrical engineers during a recent convention. Wood in the structure is protected by Monsanto Penta.

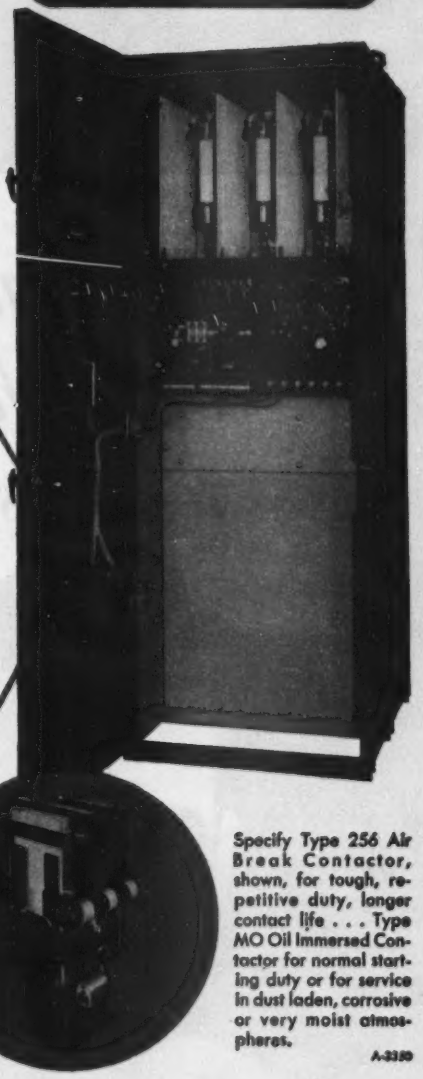
PENTA

MONSANTO CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Complete Control and Protection for Your Motors

Type H Starters



ONE ATTRACTIVE easy-to-install steel cabinet is all you need between line and motor when you specify Allis-Chalmers Type H Starters. Contactors, protective devices, meters, relays . . . everything you need for complete control and protection of your motors is built into Type H Starters. You get:

1 **Short Circuit Protection . . . provided by current limiting fuses that are easily accessible.**

2 **Overload Protection . . . Thermal relays have compensating elements — automatically adjust for ambient temperatures — trip on motor overload only.**

3 **Safe, Accessible Cubicle . . . upper front compartment encloses disconnect type fuses; lower front compartment, the low voltage control devices; rear compartment, the high voltage equipment.**

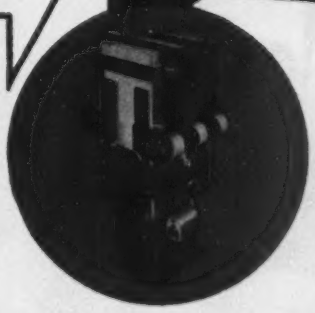
4 **Easy Installation . . . single steel enclosure is easy to handle, internal wiring is complete, wiring terminals accessible, easy to connect.**

5 **Personnel Protection . . . high voltage fuse compartment has electrical interlock.**

6 **Meters, Push Buttons, Recording Instruments, Rheostats, and similar devices you may need are mounted on the door of the low voltage compartment.**

Other features include undervoltage protection . . . and your choice of either air break or oil immersed contactors — whichever is best for your application.

For motor control that is engineered to your job, specify Allis-Chalmers Type H Starters for motors with ratings up to 2500 hp. Call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 14B6410A.



Specify Type 256 Air Break Contactor, shown, for tough, repetitive duty, longer contact life . . . Type MO Oil Immersed Contactor for normal starting duty or for service in dust laden, corrosive or very moist atmospheres.

A-2380

ALLIS-CHALMERS

*Who benefits by 354 different Westinghouse Instruments to measure current?**

Product Engineers

The wide variety of Westinghouse Instruments helps you to realize primary design objectives—to make your product look better, perform better, sell better. For any application there's extra design freedom in the unusual diversity in size, types of mounting, accuracy and styling . . . the almost unlimited variety of ratings and style combinations. And the performance of all Westinghouse Instruments meets ASA Standards.

Production Chiefs

Proper instrumentation of production machines, processes or power supply can help you to attain more production, closer quality control or lower production costs. Whether your needs involve measurement of amperes, volts, watts, vars, power factor, frequency or synchronism, there's a Westinghouse Instrument for the job. The line also includes many types to measure position, time, temperature and speed. And Westinghouse Instrument Application Engineers are ready to assist you in applying them most effectively.

Purchasing Agents

In the full line of Westinghouse Instruments, you have a complete source of supply —one responsibility—for all of your electrical measurement needs. Moreover, Westinghouse offers you faster service because all designs are keyed to chassis stocking and assembly procedures.

Benefit this way!

Here's an example. A leading pipeline company, in a radical departure from conventional pipeline instrumentation, is using Westinghouse Electrical Measuring Instruments in pumping stations for pressure and flow indications at various points on the system. The result: More efficient control without fire hazard; greater accuracy; substantially less maintenance—a big, long-range saving! So if you design a product, produce it, or buy for it . . . specify Westinghouse Electrical Measuring Instruments!

J-40420

*

The extensive coverage of Westinghouse current-measuring Instruments is further emphasized by the fact that there are 32 different instruments just to measure microamps.

For complete information about all Westinghouse Electrical Measuring Instruments, write for Booklet B-4696. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE... IF IT'S

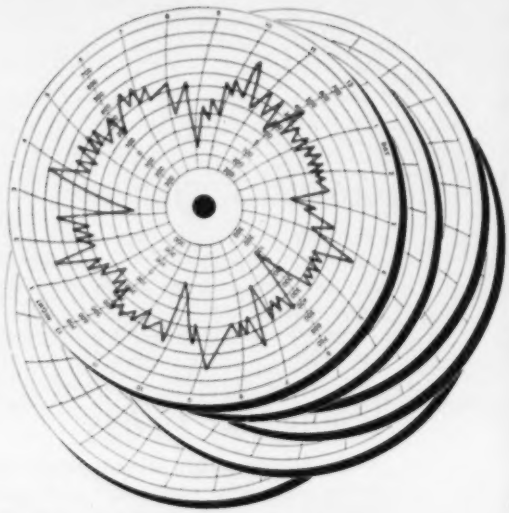
Westinghouse

INSTRUMENTS

SILICONE RUBBER COATED
FIBERGLAS TUBING

BH "1151"

ELECTRICAL INSULATION



. . . permanently flexible for Class H temperatures

Will your present high temperature insulation meet these tests? Can it be twisted and bent to withstand operational and assembly stresses — without cracking, crazing or loss of dielectric strength, or flexibility? Will it remain unchanged after *continuous* operation from −90°F. to 400°F. . . . or 15 minutes at 600°F., 4 hours at 500°F., 96 hours at 450°F.?

BH "1151" will! Its remarkable flexibility and dielectric strength is built into its base materials. BH "1151" combines two great inorganic materials — Fiberglas and Silicone Rubber. The result is electrical tubing and sleeving with remarkable long life — with flexibility for the life of the insulation.

BH "1151" will not support fungus growth — offers excellent chemical resistance. Meets *all* applicable Class H NEMA specifications.

Available in colors, for circuit tracing and coding in economical continuous coils, 36 inch lengths, or in short pieces cut to individual specifications. Made in Grades H-A-1, H-B-1, H-C-1 and H-C-2, rated up to 7,000 volts. For complete facts on superior BH "1151" write for data sheets and samples today.

Address Dept. W-9
Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393550). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

P&H has done it again!

This time P&H scooped the industry with a machine that will change your ideas about small truck cranes.

It's a tremendous innovation — 100% automotive in concept and construction. You'd hardly believe a machine that does so many things could be so simple, so compact, so easy to operate, so powerful. What backbone! Everything is designed around a rugged power box built of inch-thick steel plate — all welded to preserve perfect alignment. Like a tank transmission, you can stake your life on it!

RIDES ON ANY SUITABLE TRUCK — Mounting? New, used, or rebuilt, your P&H dealer will do it — or do it yourself . . . it's easy.

CONVERTS EASILY ON THE JOB — Whatever you require — shovel, crane, dragline, trench hoe, clamshell or magnet, you have it with simplified attachments you can change right in the field. And with any one of them, you'll have the famous P&H stability that gives you greater work capacity. Your P&H dealer has all the facts.

Write today for Bulletin TX-127

P&H TRUCK CRANE DIVISION

HARNISCHFEGER CORPORATION

Milwaukee 46, Wisconsin

See your P&H Dealer!

Here's Proof of Performance...

ERECTED IN 1914, THESE POLES ARE PROTECTED BY

CREOSOTE OIL

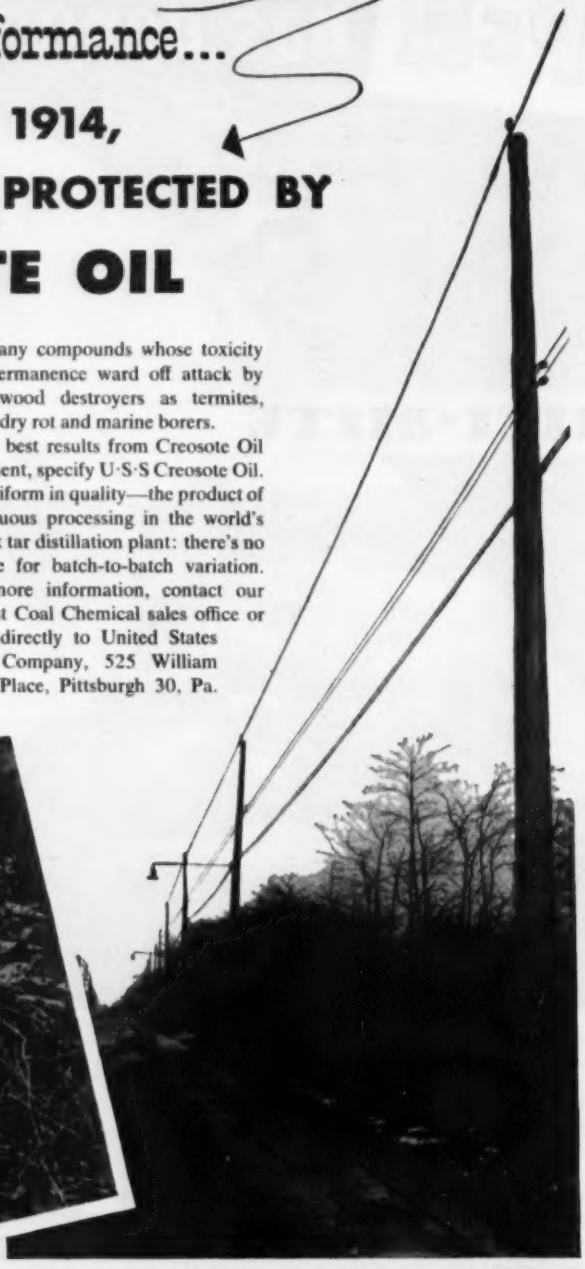
● Protected by Creosote Oil, these pine poles have stood for 38 years and are still in good condition. They are owned by New York Telephone Company, and are located along Arthur Kill Road, Staten Island.

A recent inspection showed these poles will be in good condition for many years to come.

You'll find that wood treated with Creosote Oil consistently turns in outstanding records of service. No other preservative can match its proved effectiveness.

Creosote Oil contains not only one but many compounds whose toxicity and permanence ward off attack by such wood destroyers as termites, fungi, dry rot and marine borers.

For best results from Creosote Oil treatment, specify U·S·S Creosote Oil. It's uniform in quality—the product of continuous processing in the world's largest tar distillation plant: there's no chance for batch-to-batch variation. For more information, contact our nearest Coal Chemical sales office or write directly to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.



U·S·S CREOSOTE OIL

USS

UNITED STATES STEEL

from kindergarten through college.....EYES ARE BRIGHTER.....LESSONS LIGHTER

WITH GUTH-LIGHT ON THE SUBJECT!

With GUTH-LIGHT, students enjoy effortless vision.

The reason: GUTH fixtures provide the right *quantity and quality* of light . . . plenty of light, evenly distributed to give freedom from shadows and glare.

The result: Normal vision is protected and lessons are easier. Students have more energy and better posture.

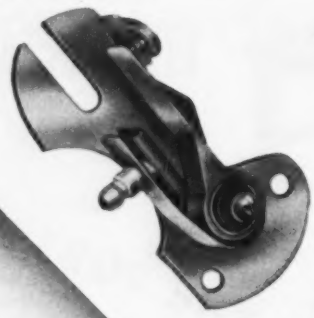
Whether you have a kindergarten or college lighting problem, it will pay you to contact your GUTH resident engineer about GUTH Precision-Planned School Lighting . . . or write for our School Lighting Catalog.

SEELUX* — 3-ring, open-bottom for silver bowl lamps with heatproof Alzak Aluminum** louvres.

*Patent Pending

**® and Patented, Aluminum Co. of America

How to cut contact costs without cutting corners



Consider the case of this contact assembly for a large manufacturer. The contact material is tungsten. The entire assembly consists of 16 separate parts . . . including springs, bushings, rivets and cam blocks.

Originally Mallory supplied only the contacts. Other parts were bought from various suppliers. Still others were made in the manufacturer's own plant where he also handled the complete assembly operation.

Then he discovered the economy of having Mallory do the entire job—from material procurement and inspection . . . to fabrication and finishing of parts . . . to final assembly. The burden of ordering, delivering, scheduling, warehousing and production is now in the hands of men who are thoroughly qualified by years of experience in the production of all kinds of contacts.

This manufacturer is using tens of thousands of these contacts every month. By letting Mallory make the complete assembly he has concentrated production responsibility and is getting a better assembly at a lower cost.

Call or write Mallory today. You'll find, as this manufacturer did, that it pays in many ways to depend on Mallory for your complete contact assembly needs.

EXPECT MORE . . . GET MORE FROM MALLORY

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

P R MALLORY & CO Inc

MALLORY

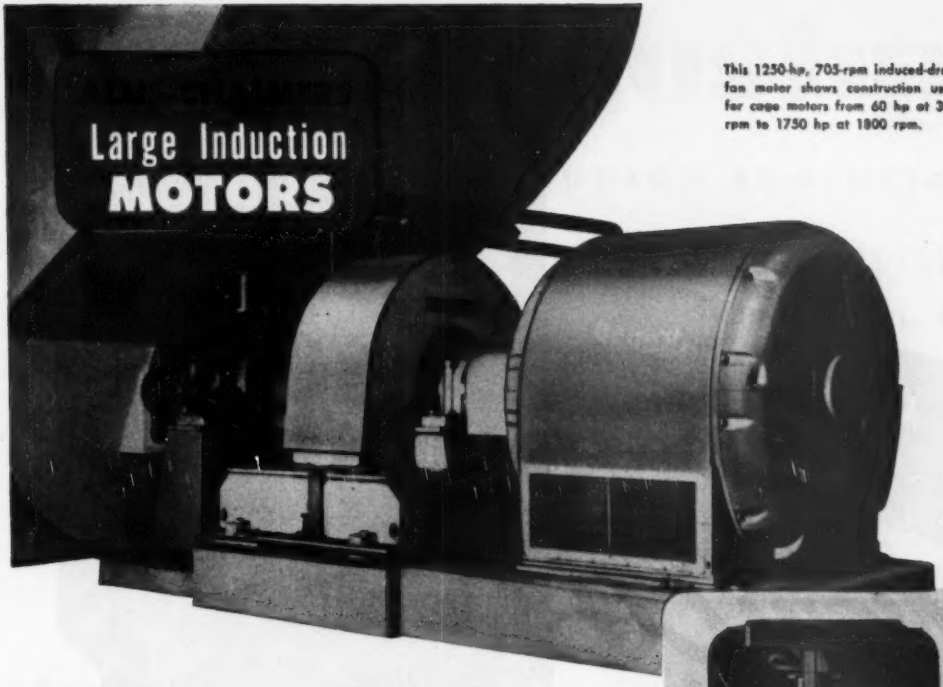
SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators

Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries

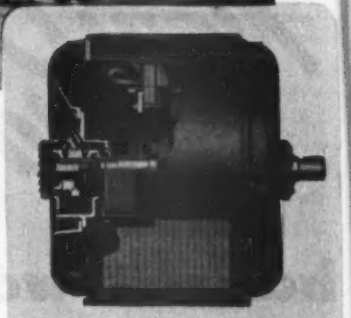
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO., INC. INDIANAPOLIS 6, INDIANA



This 1250-hp, 705-rpm induced-draft fan motor shows construction used for cage motors from 60 hp at 300 rpm to 1750 hp at 1800 rpm.

GOOD TO LOOK AT...
and Worth Looking Into



Cutaway view indicates construction features of this modern motor. For details, ask your A-C representative for Bulletin 05B7542, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

THIS MODERN Allis-Chalmers cage motor looks good in modern power plants—one glance at its clean, simple lines and smooth contours tells you that. But only a careful check of its design features can show how much it offers in all-around protection, easy accessibility, and operating dependability.

Protection begins with drip-proof construction as standard above 500 rpm. (Splash-proofing entails no change in external appearance.) In addition, louvers on air discharges and design of intakes keep foreign objects out of the motor.

Accessibility starts paying dividends during installation; large stator air discharge openings allow ample room for drilling, doweling and bolting. And they encourage cleaning of air passages back of the stator core. For cleaning or inspecting the windings, only the upper halves of the end shields need be removed — there's no need to disturb the bearings.

Dependability stems from rigid cast-iron end shields that assure maintenance of correct bearing alignment. Capsule-type bearing housings protect the bearings and oil supply while the motor is being cleaned. And other construction details further uphold the reputation for long-life reliability enjoyed by Allis-Chalmers motors. A-3828

ALLIS-CHALMERS

Another Westinghouse Relay Development

New CO Relay

The Type CO Overcurrent Relay is available in Flexitest or standard rectangular projection case.

has a "Two-in-One" Time Curve

One relay now gives you two time curves. Inverse and very inverse relays are identical except for calibration and may be changed from one curve to the other (or intermediate curve) simply by changing the calibration adjustment—a new high in protective relaying flexibility.

The CO Relay also offers superior performance in accuracy. Its new "E" element has four independent adjustments to assure accuracy over the entire operating range.

Flexibility, accuracy and reliability combine in the new CO Relay to represent the greatest advance in overcurrent relaying since Westinghouse developed the induction disc relay.

Ask your Westinghouse representative to show you the new CO Relay—he'll be glad to go over it feature by feature with you—or request a demonstration by writing to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40409

YOU CAN BE SURE...IF IT'S Westinghouse

RELAYS

Joslyn

JUNIOR LUMINAIRES

FOR Improved

RESIDENTIAL STREET LIGHTING

Controlled illumination with attractive enclosed units at low cost

1 Narrow asymmetrical light pattern for residential streets

2 Totally enclosed glassware unit —die cast aluminum head—Alzak* aluminum reflector—Joslyn wedge-band gasketless glassware seal—Holophane refractor or rippled globe

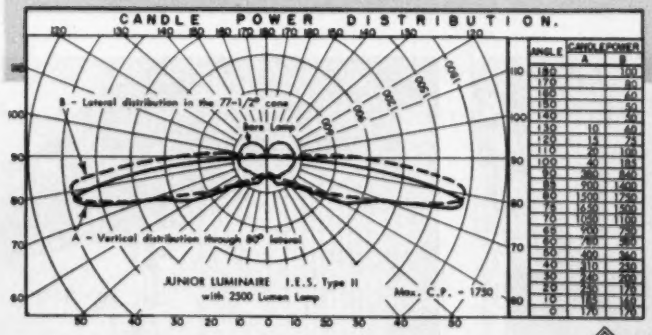
3 Combines the advantages of a larger luminaire in a small, compact, less expensive unit

4 Designed also for top mounting with die cast aluminum or D. P. porcelain heads

*Manufactured under Aluminum Co. of America patents

Available for

I. E. S. TYPES II, II Four-Way, IV AND V LIGHT DISTRIBUTIONS with 1000 or 2500 lumen lamps


CANDLE POWER DISTRIBUTION.
B – Lateral distribution in the 77-1/2° zone
Bare Lamp
A – Vertical distribution through 80° lateral
JUNIOR LUMINAIRE I.E.S. Type II
with 2500 Lumen Lamp
Max. C.P. – 1750

ANGLE	CANDLEPOWER A	B
180		100
170		80
160		60
150		50
140		50
130	10	60
120	15	75
110	20	100
100	40	135
90	280	840
85	900	1400
80	1500	1750
75	1650	1500
70	1050	1100
65	700	780
60	500	560
40	310	250
30	240	200
20	230	175
10	185	160
0	170	170

Complete Line Equipment

Joslyn

MFG. AND SUPPLY CO.

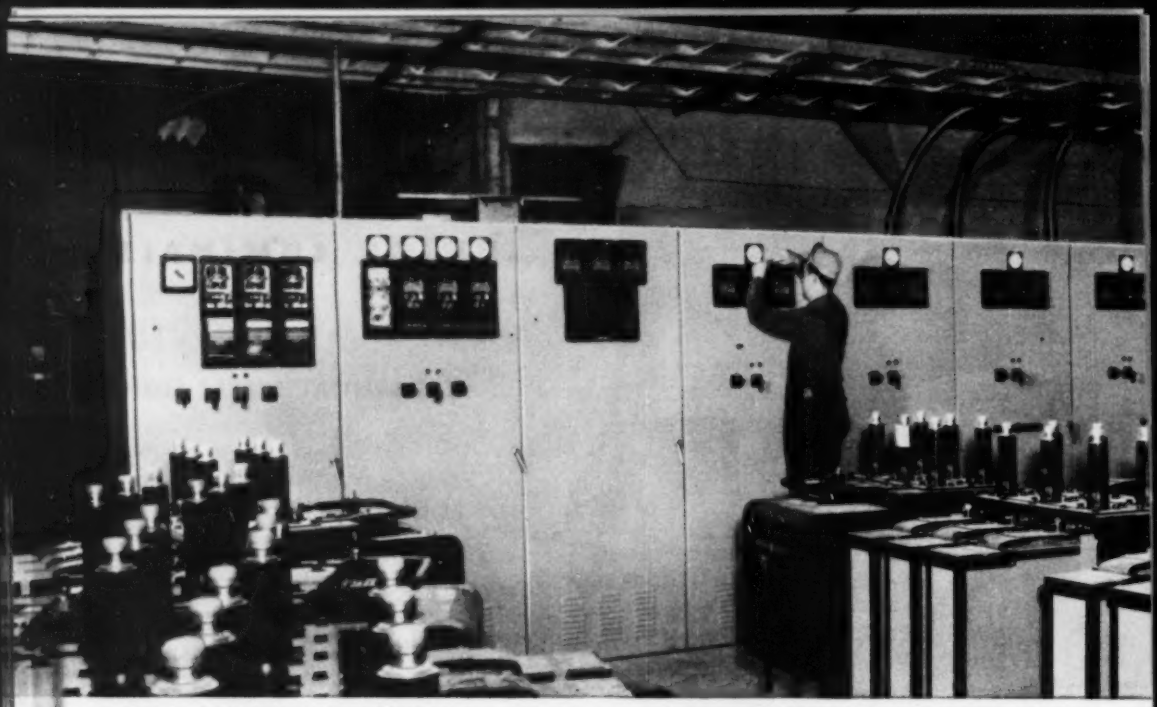
20 North Wacker Drive • Chicago 6, Ill.

BRANCH OFFICES IN PRINCIPAL CITIES

The Joslyn Co. • The South East Joslyn Co. • Southern Joslyn Co. • Joslyn Southwest Co. • Joslyn Pacific Co.

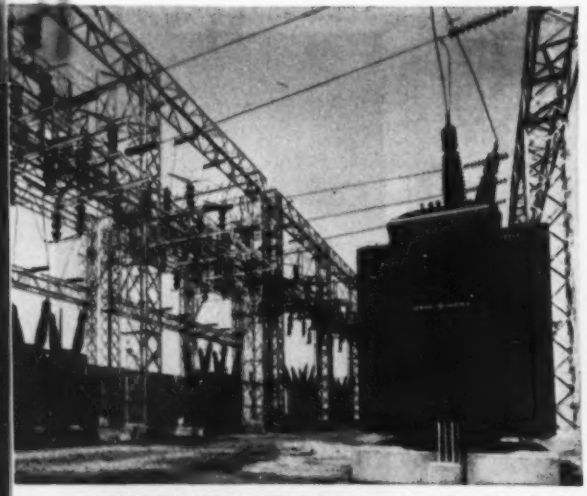
Now **Also Available**

Joslyn Junior Luminaires with
Automatic Latching Glassware
1 Automatic Latching Glassware permits ease of lamp replacement
2

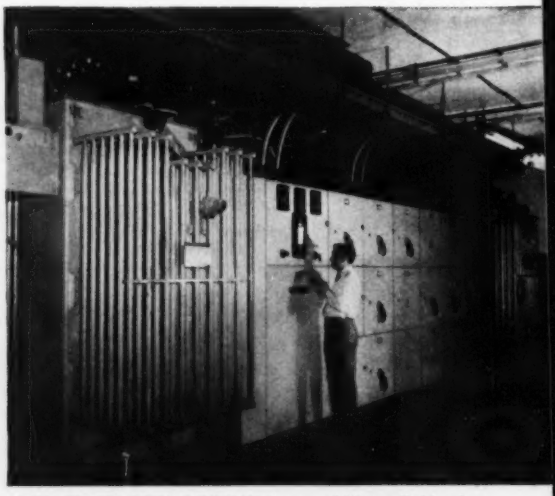


IMPROVED G-E METAL-CLAD SWITCHGEAR shown being installed above, has many new features that provide for increased safety and protection against power shut-downs. Units in the foreground are removable 13.8-kv G-E magne-blast circuit breakers, ready to be moved into all-steel switchgear compartments. Switchgear unit was supplied fully assembled, ready to connect.

How General Electric Switchgear Helped

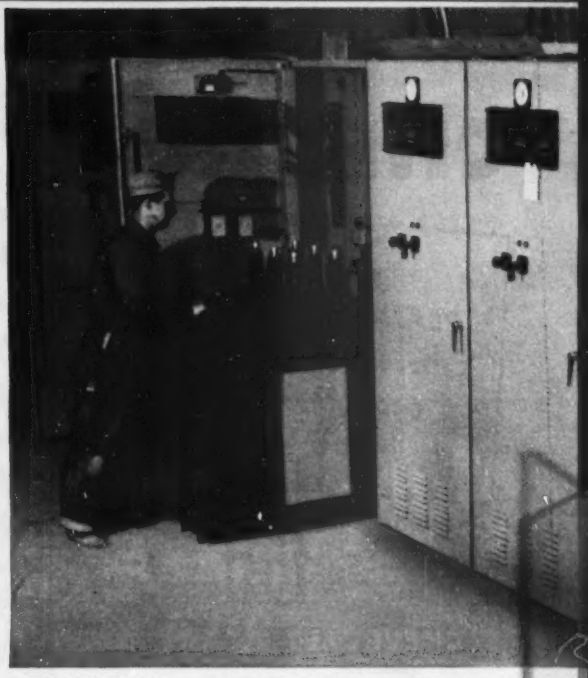


OUTDOOR SUBSTATION, built entirely from standard units, including transformer, oil circuit breakers and complete steel structure. Standard units saved months in planning and installation.



LOAD-CENTER UNIT SUBSTATION, one of 18 installed in plant, supplies low voltage power close to machines—eliminates voltage drop encountered with long, low-voltage feeder systems.

SHADOW-PROOF INSTRUMENTS with new, easier to read, long scales, are typical of many advances featured in improved G-E Metal-clad Switchgear. Instruments enable constant check to be kept on many circuits feeding power throughout plant.



REMOVABLE MAGNE-BLAST CIRCUIT BREAKER, offers maximum accessibility for testing and inspection—may be easily replaced with a spare if necessary. Adequate interrupting capacity gives full protection against electrical failures.

Speed Major Production Change-over

Standard equipment helps solve difficult conversion problem —gets defense plant in production 3 months ahead of schedule

When one of the nation's biggest manufacturers planned to convert a 53 acre light duty assembly plant into the country's largest tank arsenal, electric power requirements posed a major problem. To handle the tremendous demands of such a heavy industrial operation, a completely new power distribution system was needed. It had to be dependable, with maximum protection against power shut-downs. And it had to be installed fast, to meet an almost "impossible" production schedule.

Based on recommendations of General Electric engineers, this plant got one of the finest and most dependable power distribution systems ever installed in an American factory. What's more, they got it in record time.

All power used throughout the plant flows through standard G-E Metal-clad switchgear. Supplied factory-assembled, ready for installation, it saved months of time-consuming on-the-job engineering and assembly. Having the entire power distribution job handled as a co-ordinated project by G-E engineers was an essential part of the excellent planning that resulted in starting production three months ahead of schedule.

For examples of the equipment used, see the pictures at left and above. For information on how similar equipment can help your modernization or expansion plans, send for Bulletin GEA-5600, "Electric Power for Industry's Third and Biggest Expansion"—or call your local G-E Apparatus Sales Office. General Electric Company, Schenectady 5, New York. 854-47

GENERAL ELECTRIC

Advance-Design

CHEVROLET TRUCKS

These PLAIN HARD FACTS are important to economy-minded truck buyers

first in demand in value in sales

CHEVROLET

Fact No. 1

CHEVROLETS LIST FOR LESS

First cost—*the list price*—is less for a Chevrolet than for any comparable truck capable of handling the same payload. Chevrolet's position as the world's largest manufacturer of trucks makes possible production savings that are passed on to you.

Fact No. 2

COST LESS ON THE JOB

Proved Chevrolet truck features save money over thousands of miles. Time-tested Valve-in-Head engines, rugged hypoid rear axles, extra-sturdy channel-type frames, Flexi-Mounted cabs, Ball-Gear steering, Synchro-Mesh transmissions, all contribute to low operating costs with high dependability.

Fact No. 3

EACH TRUCK TAILORED TO ITS JOB

Every Chevrolet truck is factory-matched to the job it's going to do. Tires, axles, frame, springs, engine, transmission, and brakes are right for the operating conditions and load. Whatever your job is, there's a Chevrolet truck to fit it.

Fact No. 4

WORTH MORE AT TRADE-IN TIME

Chevrolet trucks traditionally bring more at resale than other makes costing about the same when new. Chevrolet trucks keep their value longer and give you real, substantial savings right up to the day you sell them. See your Chevrolet dealer soon.

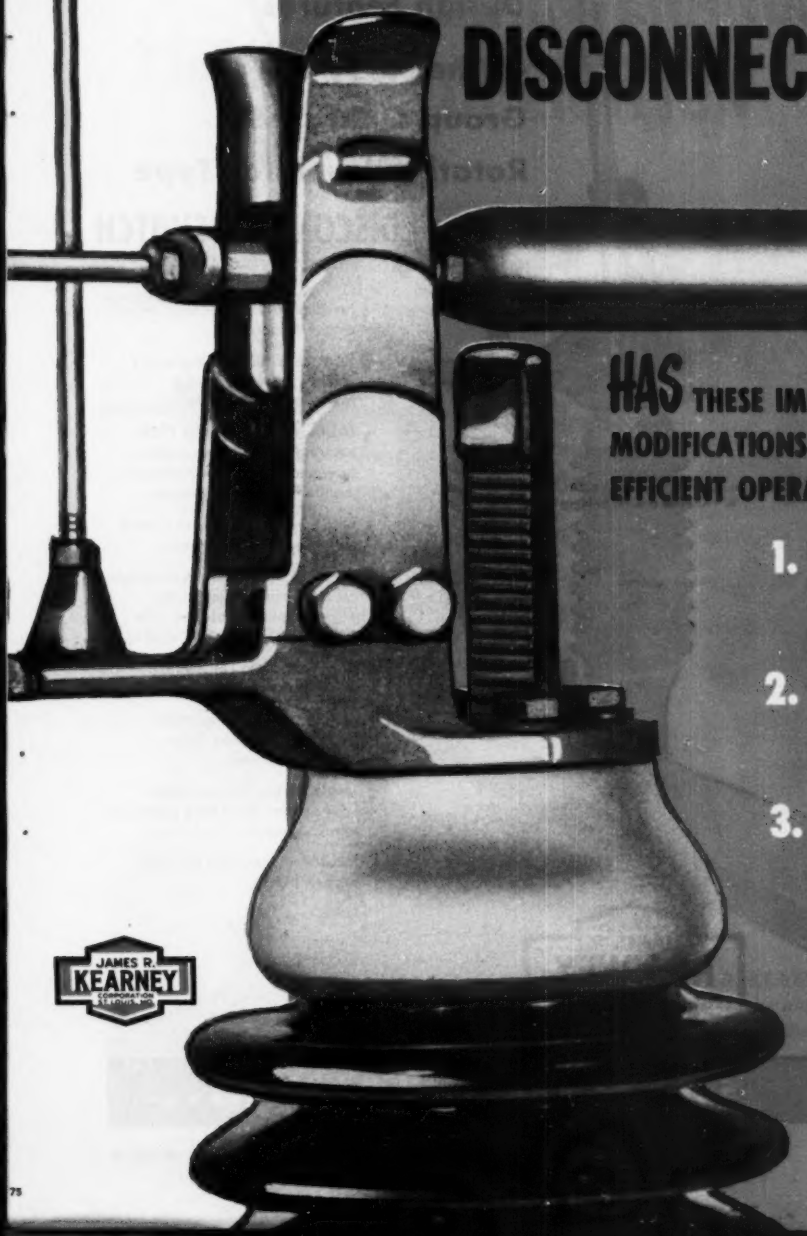
CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load • **POWER-JET CARBURETOR**—for smooth, quick acceleration response • **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement • **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting • **HYPOID REAR AXLE**—for dependability and long life • **TORQUE-ACTION BRAKES**—on light-duty models • **PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES**—on medium-duty models • **TWIN-ACTION REAR BRAKES**—on heavy-duty models • **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models • **CAB SEAT**—with double-deck springs for complete riding comfort • **VENTI-PANES**—for improved cab ventilation • **WIDE-BASE WHEELS**—for increased tire mileage • **BALL-TYPE STEERING**—for easier handling • **UNIT-DESIGNED BODIES**—for greater load protection • **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

The NEW KEARNEY *Group Operated*

ROTATING INSULATOR TYPE DISCONNECT SWITCH



HAS THESE IMPORTANT MODIFICATIONS TO PROVIDE MORE EFFICIENT OPERATION — LONGER LIFE:

1. Heavy leaf type beryllium copper spring contacts with silver overlay at both ends of blade.
2. Fully adjustable to compensate for any changes in switch mounting structure.
3. Positive current path to blade through *blade* contacts at both ends of switch. Hinge mechanism does not carry current.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue
St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

See the following pages for additional features of this improved Kearney Switch

These Improvements

Check These Advanced Design Features of the NEW KEARNEY Group Operated Rotating Insulator Type DISCONNECT SWITCH

- √ Streamlined design with smooth edges throughout.
- √ Stop on base bearing easily adjusted to synchronize break on each phase.
- √ Blade operates in two Oilite bearings for all temperature operation. Bearings require no maintenance or lubrication.
- √ Blade lever adjustment sealed with noncorrosive grease.
- √ Stainless steel spring in neoprene jacket. Easily adjusted for desired counterbalance. (On switches rated 34.5KV and up.)
- √ Main hinge pin rotates in Oilite bearing.
- √ Arm rotates in completely weather-protected Oilite bearing in frame.
- √ Single arcing horn operates easily under ice. Easily replaced when necessary.
- √ Tubular, electrolytic bus bar copper blade.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

175

Specify KEARNEY Products . . .

Guarantee

COOLER, MAINTENANCE-FREE OPERATION

With this switch you get dependable performance under every variety of weather and operating conditions.

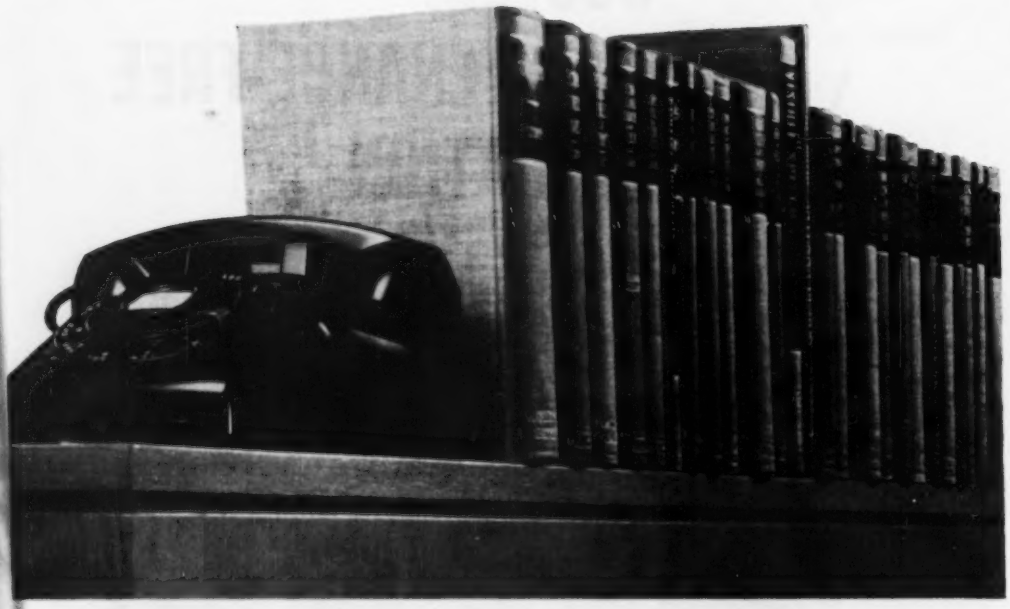
Kearney GROUP Operated Disconnect Switch Rotating Insulator Type
600 Amps., 7.5KV to 69KV;
400 Amps., 7.5KV to 34.5KV.

Write for more detailed information
Ask for bulletin 0-33

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant Guelph, Ontario

Better Construction – *SAFER* Maintenance

Telephone Science Shares Its Knowledge



The Bell Telephone Laboratories Series of books is published by D. Van Nostrand Company. Other technical books by Laboratories authors have been published by John Wiley & Sons. Complete list of titles, authors and publishers may be obtained from Publication Dept., Bell Telephone Laboratories, New York 14.

List of Subjects: Speech and hearing, mathematics, transmission and switching circuits, networks and wave filters, quality control, transducers, servomechanisms, quartz crystals, capacitors, visible speech, earth conduction, radar, electron beams, microwaves, waveguides, traveling wave tubes, semiconductors, ferromagnetism.

In their work to improve your telephone service, Bell Laboratories make discoveries in many sciences. Much of this new knowledge is so basic that it contributes naturally to other fields. So Bell scientists and engineers publish their findings in professional magazines, and frequently they write books.

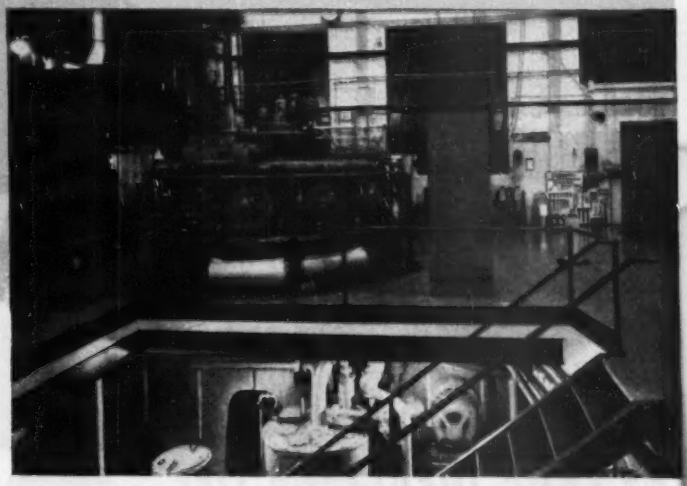
Most of these books are in the *Bell Telephone Laboratories Series*. Since the first volume was brought out in 1926, many of the books have become standards . . . classics in their fields. Twenty-eight have been published and several more are in the making. They embody the discoveries and experience of one of the world's great research institutions.

Bell scientists and engineers benefit greatly from the published findings of workers elsewhere; in return they make their own knowledge available to scientists and engineers all over the world.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides challenging opportunities for individual achievement and recognition in scientific and technical fields.

HOW TO GET MORE POWER IN LESS SPACE...



Marshall, Michigan increases plant efficiency with

NORDBERG *Radial* DIESEL

When the City of Marshall, Michigan needed additional Diesel engine generator capacity without adding to existing plant floor space, careful study proved that the most efficient solution was the installation of a new Nordberg *Radial* Diesel Engine producing 1200 KW.

Here are some of the important reasons behind this selection of a Nordberg *Radial* Diesel: ☆ *Compact cylinder arrangement requires one-half of the floor and headroom space usually required.* ☆ *Well balanced, vibrationless engine permits simple, inexpensive foundation . . . down to 20% of normal requirements.* ☆ *Generator and accessories located below engine, in space ordinarily taken by large foundation (note illustration, above).* ☆ *Lower first cost—lower operating and maintenance cost.*

NORDBERG 2-CYCLE RADIAL ENGINES develop 1980 to 2125 hp, or 1250 to 1500 kw, at 400 rpm. Available as oil burning Diesels, as spark-fired gas burning engines, and as Dualfuel® engines burning oil, gas or any combination of both.

Applicable for municipal and industrial power plants and central stations . . . wherever compact, economical, dependable power is required. *For full details, send for Bulletin.*

The Nordberg *Radial* Diesel is just one of the outstanding developments made by Nordberg in the internal combustion engine field. As builders of America's largest line of heavy duty Diesels, from 10 to over 10,000 hp in a single engine, Nordberg is well qualified to recommend exactly the right engine to meet your specific requirements.

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LAPP PORCELAIN

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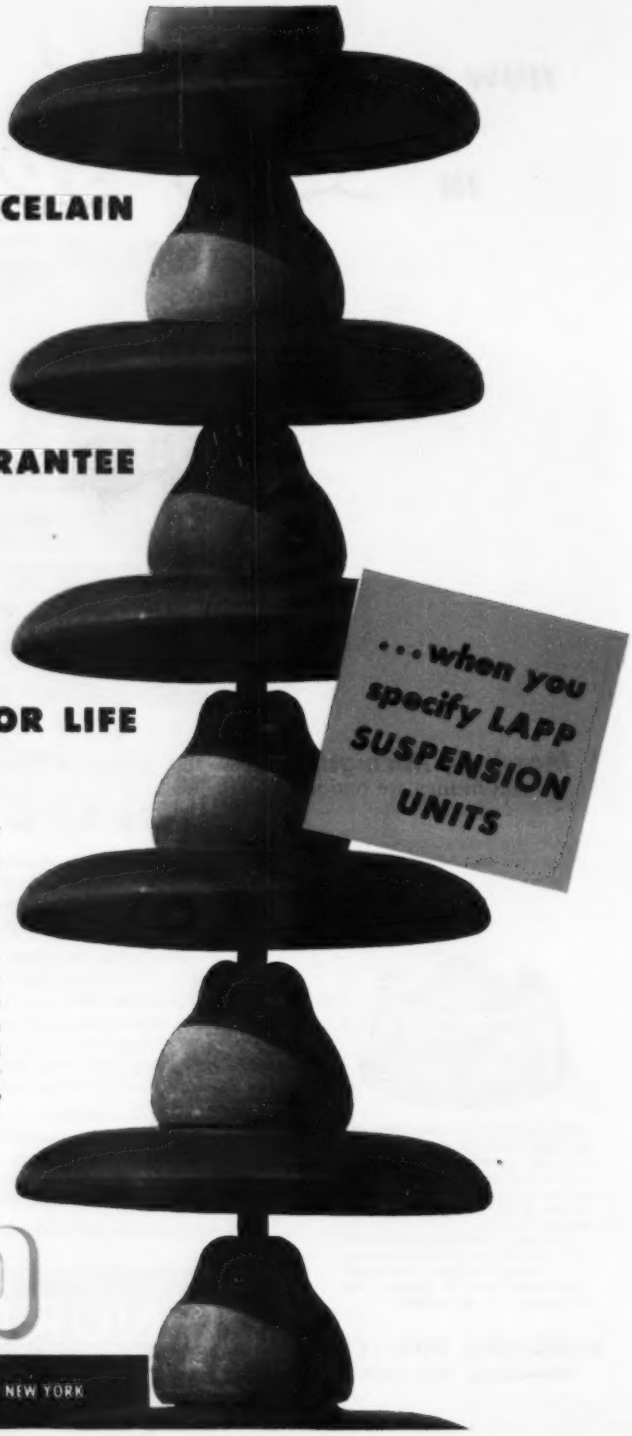
OF LONG INSULATOR LIFE



Insulator life depends on soundness of porcelain, and assembly which gives it the best chance to live. For greatest insulator serviceability, look to the quality of the porcelain, and to assembly which recognizes the physical characteristics of the porcelain. Nowhere have these two requirements been the subject of more study, nor the object of more production care than at Lapp. The Lapp reputation for porcelain quality is ample basis for your confidence in the specification *"Lapp Suspension Insulators."*

Lapp

LAPP INSULATOR COMPANY, INC., LEROY, NEW YORK

new PACKAGED carbon dioxide FIRE EXTINGUISHING SYSTEM

perfect for transformer vaults

Do you want maximum fire-fighting power at minimum cost? Then you want the new Kidde Standard Pak. It's an inexpensive ready-made system you can build in for automatic protection against tough fires in transformer vaults.

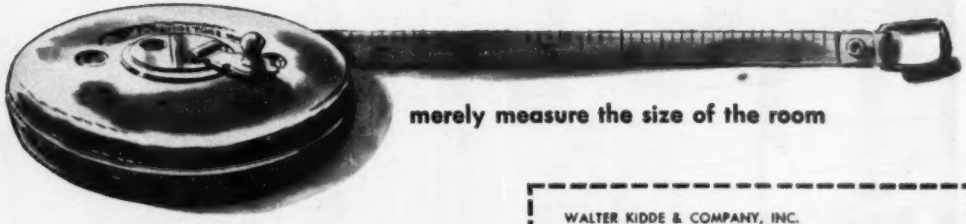
Anyone who can cut pipe can set up this pre-engineered fire extinguishing "package." Choose from six sizes for volumes up to 6,000 cubic feet.

Every kit contains Kidde rate-of-rise heat detectors, Kidde Multijet nozzles, and automatic discharge heads. Pipe and fittings are optional, as are pressure trips and switches, remote controls, sirens, gongs.

For full information send the coupon.

any pipefitter can install it

pre-engineered



merely measure the size of the room

Kidde

Walter Kidde & Company, Inc.
930 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

WALTER KIDDE & COMPANY, INC.
930 MAIN ST., BELLEVILLE 9, N. J.

Gentlemen. Please send me details on the New Kidde Packaged Fire Extinguishing System.

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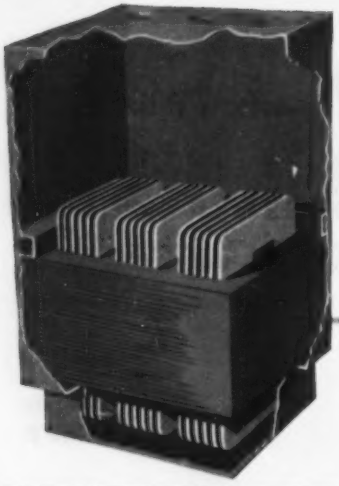
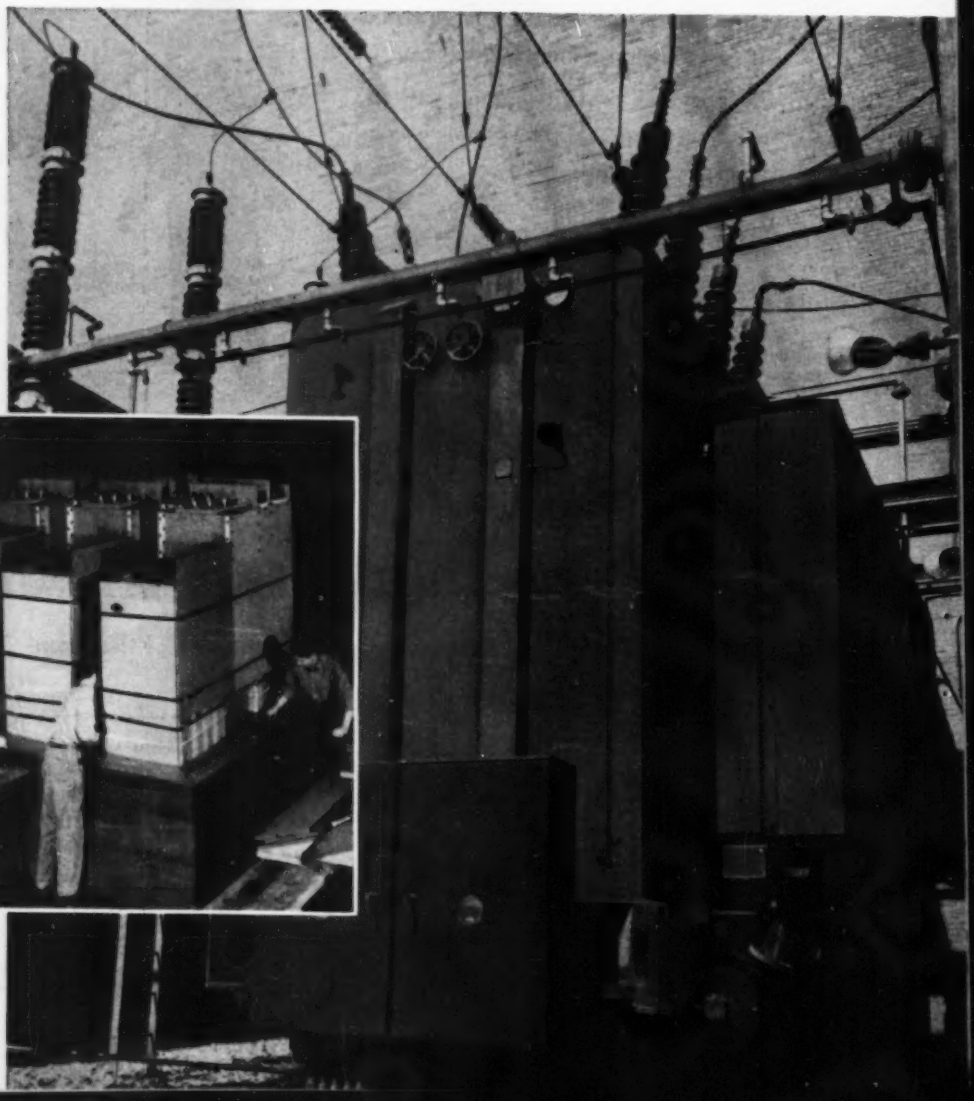


This design



assures efficient cooling

The Form-Fit design of Westinghouse Power Transformers directs cooling oil to assure efficient heat transfer . . . efficiency that contributes directly to the superior operating characteristics of these transformers.

The reasons for this efficiency are based on fundamentals of transformer operation. Heat in any transformer comes from two sources: the coils and the core. The snug-fitting tank on a Form-Fit transformer directs the oil to the heat-dissipating surfaces in the quantities required. This assures maximum use of the cooling oil. The pancake-type coils, standing in a vertical plane, form natural flues for rapid circulation—on *both sides* of each coil—resulting in low temperature gradients. This provides a greater cooling margin for overloads.

Form-Fit construction is ideal, too, for forced oil cooling. Since directed oil flow is inherent in the design, no baffles or other artificial devices need be introduced.

This compact, efficient design, with the added savings in size and weight affected by Hipersil® Cores, makes Westinghouse Form-Fit Power Transformers smaller and lighter per kva than any other design. As a result, they can be shipped more completely assembled; are more economical to install. Maintenance expense, consistently, runs lower. Your Westinghouse representative will be glad to discuss the savings possible on your system, or write for Booklet B-4142A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70639

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Westinghouse
POWER TRANSFORMERS

95,000 kva
3-phase, 60-cycle, FOA
132 kv to 69 kv

SANTA CLAUS

Could Die of Old Age

No one shoots Santa Claus. This remark about a government which spends and spends and spends may well be true. But it is also true that Santa Claus is an old man. At his age overwork might well kill him.

It is with the possibility of working Santa Claus to death that this editorial is concerned. No position is taken as between the contending political parties in the present campaign. Our concern is with the problem of protecting Santa Claus.

It is true that as a nation we now enjoy great prosperity. The prosperity is not nearly so general as the political advertisements of it would suggest. Millions of individuals, notably those living on pensions, annuities and other fixed incomes, have been robbed of half their purchasing power by inflation during recent years, and whole industries know little or nothing of boom times.

However, measured by so basic a gauge as unemployment, we do have great prosperity. Less than two million of our total working force of over 64 million are unemployed, and many of them are unemployed only while moving from one job to another. The real income, i.e., what their dollars will buy, of those with jobs is somewhere near its all-time peak.

Our Prosperity is Precarious

The prosperity we enjoy, however, is precarious. This is primarily because it is dependent upon a rising volume of expenditures by the federal government. At present almost a quarter of our entire national income is ladled out through Washington, and in an ever increasing amount.

If, as matters now stand, federal expenditures were to be suddenly and sharply cut, our government-financed prosperity would be severely upset. But if the federal government were to try to keep right on providing prosperity by steadily increasing its expenditures, the end result would be more certainly disastrous. It would be a crash caused primarily by having continuing inflation of prices destroy the value of the dollar.

Higher government expenditures of worthless dollars then could accomplish nothing. Santa Claus would be dead from overwork.

To Provide Firm Foundations

The general route to be followed in putting firm foundations under our prosperity is quite clear. It involves two steps which must be taken closely together. The first is to stop the continuous increase in federal expenditures. The second step is to substitute expanding private business for government-financed business as the principal foundation of expanding prosperity.

The increase in federal expenditures can be stopped without sacrificing any effective measures now directed toward meeting our top priority requirement—protection from armed Communist aggression. The most competent authorities of both major parties agree it can be done by (1) better planning of and the elimination of outright waste in defense arrangements, and (2) cutting those civilian expenditures which cannot be justified at the same time we are undertaking a great new load of defense expenditure.

It is also possible to substitute expanding private business for government-financed business. The problem is primarily that of relieving private business of the staggering load of federal taxation it now is carrying. Federal taxation now takes 52 per cent of all corporate profits and 82 per cent of all so-called excess profits. If it were not for the forced draft placed under our economy by rapidly mounting defense expenditures, this burden would surely lay a disastrous blight on private business expansion. If expanding private business is to have a chance to play its critical role as a substitute for government-financed business, its taxes must be cut, and soon.

It Won't be Easy

It would be naive to contend that it will be easy to check the expansion of federal expenditures. They have been running wild too long, and in the process contributing to a feverish, inflationary prosperity. Likewise, there is no reason to believe that the easing of the load of business taxes is going to be easy. The basic blight it puts on business expansion has been too long obscured by having our economy dosed with artificial stimulants, most notably enormous injections of federal expenditures.

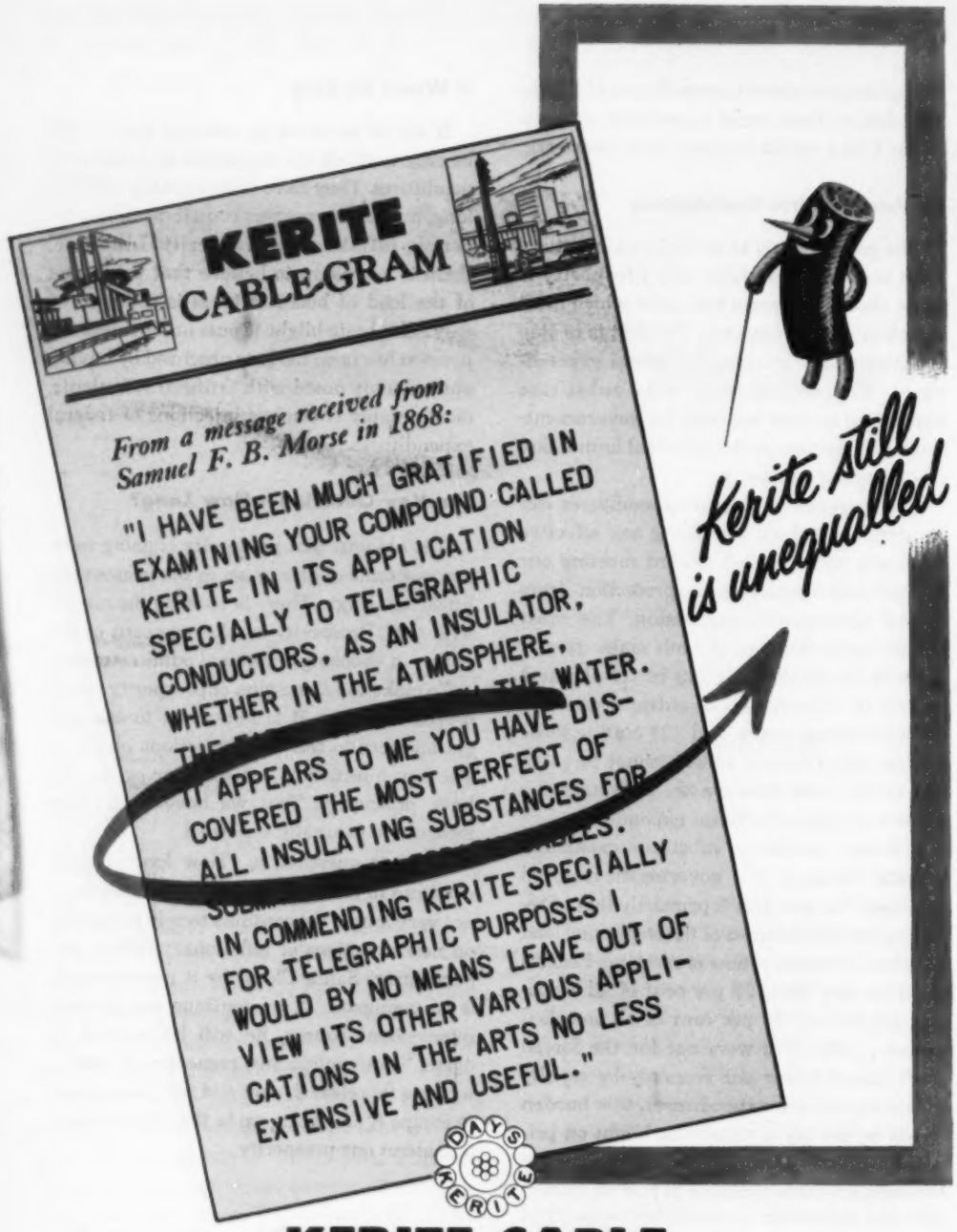
The Key Question—How Long?

It is obvious that prosperity is going to be a major topic of discussion in the present political campaign. There is nothing the matter with that. Prosperity is a key concern of the voters in choosing a national administration.

To make the discussion of prosperity really useful, however, it is important to ask and get answers to the right questions about it. The key question is not whether or not we have prosperity. That we have it in large measure is generally conceded.

The key question is, "How long can we continue to have prosperity?" The answer—not very long if we continue to rely primarily on new injections of inflationary federal expenditures. Santa Claus, be it remembered, is no youngster. If we continue our present improvident course, he will be worked to death. Those politicians, regardless of party, who see this clear danger and who have plans to escape it are facing up to the crucial question about our prosperity.

McGraw-Hill Publishing Company, Inc.


KERITE
CABLE-GRAM
From a message received from Samuel F. B. Morse in 1868:
"I HAVE BEEN MUCH GRATIFIED IN EXAMINING YOUR COMPOUND CALLED KERITE IN ITS APPLICATION SPECIALLY TO TELEGRAPHIC CONDUCTORS, AS AN INSULATOR, WHETHER IN THE ATMOSPHERE,
WATER.
IT APPEARS TO ME YOU HAVE DISCOVERED THE MOST PERFECT OF ALL INSULATING SUBSTANCES FOR
IN COMMENDING KERITE SPECIALLY FOR TELEGRAPHIC PURPOSES I WOULD BY NO MEANS LEAVE OUT OF VIEW ITS OTHER VARIOUS APPLICATIONS IN THE ARTS NO LESS EXTENSIVE AND USEFUL."
DAYS KERITE
Kerite still is unequalled

KERITE CABLE

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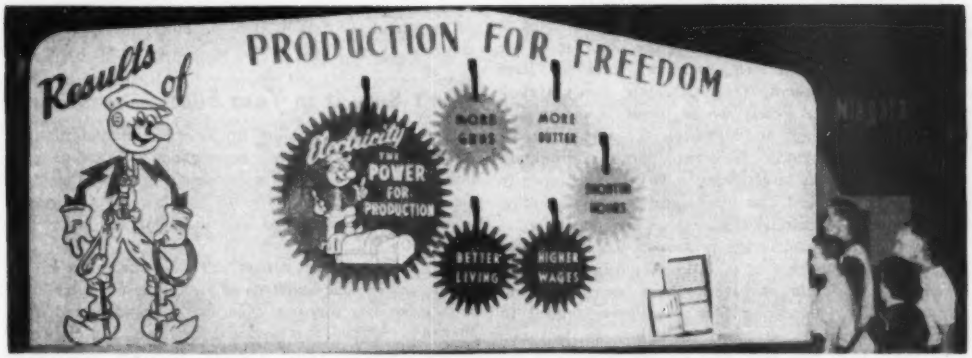
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.



Display of Wisconsin utilities at state fair shows importance of electricity to . . .

Production for Freedom

This week all industry joins the electrical industry in celebrating Production for Freedom. This celebration was conceived by a man, inspired by groups of men, and is being participated in by a significant segment of American industry. The mere fact that some important industries or groups of people have chosen to ignore the occasion is of no moment. As time goes on, those who lack interest in the broader responsibilities of American industry will fall by the wayside.

The fact remains that many men on America's management team believe that production helps make freedom possible, that it is one of the most important factors in freedom's preservation, and that it is a cause for celebration.

Today we have the threat of socialism and communism on every side. Tomorrow we will still have to face them regardless of any political changes here or abroad. Production by raising our standard of living above the subsistence level and by increasing our military strength is our greatest defense against these two menaces to our way of life. Every little activity which promotes appreciation of production as one of the main supports of freedom contributes to safeguarding that freedom.

For this reason we join the electrical industry in celebrating Production for Freedom Week.

The Centennial of Engineering

This month in Chicago the American Society of Civil Engineers is sponsoring the Centennial of Engineering to commemorate its founding. Joining the observances are all the other major engineering societies. Actually all have a good right to be there. This celebration does not mark the beginning of a society whose members design and build bridges, buildings, and highways. It marks the breakaway of civilian engineers from their parent, the military engineer. So in this larger sense it is entirely proper to consider the electrical, the mechanical, the illuminating, and all other professional engineers as civil engineers.

Since 1852 the engineering profession has made great strides. High standards have been established and followed. Great scientific discoveries have been made, and through skilled engineering they have been applied to improve the nation's standard of living. In fact our sociological gains have been possible only because of the material gains brought about by the professionally trained engineer.

But in their search for perfection in the sciences and their technical applications, the engineers have shut themselves off from their fellow men. In aiding mankind they have forgotten that mankind is more important than the aiding.

This era of isolation is ending. The engineering colleges are giving their students more courses in the humanities. Engineering societies are stressing that our civilization requires the active participation of engineers in all phases of community life. This theme is touched upon in many of the papers on the program of the Centennial of Engineering. It is a welcome sign. The engineer who by his technical accomplishments has won the respect and admiration of his fellow men must now win their friendship and cooperation by his accomplishments as a civic leader.

If this centennial celebration does nothing more than stimulate the engineer to continue his progress socially and technically, it will have made a worthwhile contribution to our national welfare and economy.

Why Should Only Carolina Be Finer?

"New street markers have been erected."

"Funds for paying the Bible teacher in the school have been increased, and books have been purchased for the Vacation Bible School."

"The PTA has purchased a bus for school activities."

"The Rotary Club cleaned up a lot which will be used as a play area for neighborhood children."

"The addition to the hospital will be completed soon."

"Five houses have been painted, and a garbage pick-up service twice a month has been inaugurated."

These are quotations from the "Finer Carolina Report" recording the progress of 85 of the 148 towns entered in the Finer Carolina Contest being sponsored by the Carolina Power & Light Co.

But even greater than the material progress being made is the spiritual progress being achieved through mutual cooperation. Here are people working together to improve their homes and communities. They are doing it as Americans used to do it before they got used to having the government do everything for them. Certainly they are working to win a prize. But all the money being spent by the utility would pay for only a fraction of 1% of the total cost of all the improvements being made. Carolina Power & Light's big contribution is not money but leadership. And such leadership is needed in practically every state of the union. (A few utilities in other states have similar contests). Why should only Carolina be finer?

Don't Bury It in Your Files

Are your files gobbling up information and material of value to others in your organization? This is a question which every elecric utility employee from the president on down should answer. And because the answer is important, it would be well to investigate before answering.

In these days when a busy executive can count his incoming mail by the hundreds of pieces, there is a tendency to take the easy way out. The mail is scanned; and if no answer is required, it is filed and forgotten. But elsewhere in the organization—on a higher or lower level—there may be others who could use or profit from the material consigned to the files. How much better it would be if such material were passed along to those who could use it.

It might be worthwhile for every utility to set aside one week each year for a reexamination of its interdepartmental and intradepartmental mailing systems. Such a study may show whether all mail is being directed to the destination where it is of most value or whether quick filing by one man is robbing others of the information which they should receive.

Relaying for Resumption after Outage

There is little use thinking that ability of a relay to pick up load after a prolonged interruption can be substantially improved by adjusting the relay's own pickup current and time setting. Both these features of representative overcurrent relays are limited by the appropriate fault current value and reasonably fast clearing. An analysis by O. Ramsaur of Pennsylvania Power & Light Co reported to AIEE indicates that the maximum safe peak load current is roughly one eighth to one seventh the maximum fault current, and these values are lower than are often assumed.

Thus the amount of feeder load that can be picked up is limited by the sustained value after the first few seconds. This is important to recognize because motor loads are an increasing proportion on practically all circuits. They tend to prolong the overall starting currents as they multiply in number.

Nor does it seem to make too much difference whether the relay is standard inverse or very inverse, except that the latter can pick up some 20% more circuit loading. Neither type nor even a simple alternative seems to provide a direct answer to this troublesome problem of rendering the protective tool capable of discriminating between undesired fault current and desired resumption of load after an outage. While the relays themselves hardly hold an answer, there are such alternatives as automatic sectionalization, especially after a fixed time delay.

In ignoring these factors, utilities may find that they are progressively cutting back feeder loads or feeder lengths just to make sure that load can be resumed after an outage. This may prolong the already distressing interruption problem.

THE ELECTRICAL WEEK

The Issue's News Highlights—Pres Donald A. Quarles of AIEE tells the Institute's Pacific General Meeting he is much interested in promoting the unity of the engineering professions. He said he intends to try to keep the organization at the forefront of this movement.

Six Washington State public utility districts have given up trying to bring Whatcom County PUD back into the fold. They are drawing up a new plan for purchase of Puget Sound Power & Light that excludes the reluctant district.

Latest from Washington—Look for a public ceremony when AEC and Ohio Valley Power Corp sign the 1.8 million kw power supply contract for new AEC plant in Ohio. Negotiations reported still running along smoothly.

Decision expected soon on use of top priority for steel to speed manufacture of equipment needed for power plants to serve AEC loads . . . Depa is seeking latest information on in-service dates of new electric generating capacity to be installed before 1955.

Rural Electrification Administration has made loans totaling $165.4 million to finance power facilities in rural areas for fiscal year ended June 30, 1952, bringing total loans to over $2.5 billion since it was organized 17 years ago . . . REA has approved a $835,000 loan to Florida Keys Electric Cooperative Association for installation of one diesel plant and conversion of another to use of Bunker "C" fuel oil.

B. W. Clark returns to head National Production Authority's electric equipment division after a three month leave. Acting Director Louis Shank leaves to join National Electric Products Corp . . . Securities and Exchange Commission associate general counsel Louis Loss resigned last week to become a Harvard Law professor . . . Robert S. Holmes, SEC utilities financial analyst, is leaving to teach at Cornell.

On the Political Front—In Portland, Ore., recently, Secretary of Interior Oscar Chapman said he did not plan to resign even though he was devoting full time to campaigning for Gov Adlai E. Stevenson. "While I'm on party business I pay my own expenses and I draw no salary," he pointed out. Chapman added it is "premature" to comment on whether he expects to remain in the cabinet if Stevenson wins in November.

A special storm manual, prepared by F. J. Fishburne, superintendent of transmission of South Carolina E&G, was credited with speeding up operations during the hurricane which struck the South Carolina coast on Aug. 30. Key men, heading various emergency operations, had held meetings to acquaint personnel with their duties only several weeks prior to storm. During hurricane 75-mile per hour wind buffeted area of company's territory. About 50% of greater Charleston was without service at one time but with emergency personnel and line crews working around-the-clock most of this was restored in a short while. A mobile generating unit also was used to serve a local hospital.

One Less Stockholder to Find—EW's Sept. 1 issue (p 16) carried a story on the search for the missing stockholders of Commonwealth & Southern Corp and listed ten among the most elusive. Before 10 am, Sept. 2, the sister of one phoned EW and supplied the present address of the stockholder. Still missing are the other nine. Can you find them?

Sale of $3-million municipal power issue to finance construction of a 7,500-kw initial capacity steam plant at Anchorage, Alaska, has been assured by an agreement reached between City Council and firms of Foster & Marshall, Seattle, and Allison Williams, Inc, Minneapolis. Agreement provides that the firms will make a legal bid for the bonds, when they are offered early next year, and pay a premium of at least 1½% of par. Bonds are to be placed on the open market and the city may sell the bonds to a higher bidder if it so desires.

From West North Central—Whiting, Iowa, citizens vote 233-to-40 to sell their municipal plant and distribution system to Iowa Public Service Co. They also voted 239-37 in favor of giving company a 25-year franchise to serve the town with electricity.

Financial—Iowa Public Service will offer its stockholders 150,122 common shares on 1-for-8 basis record Sept. 25 . . . Virginia E&P's stockholders will vote on Sept. 24 on proposal to amend employees' retirement annuity plan . . . SEC will hear Sept. 16 compromise plan for reorganization of Eastern Utilities Associates and subsidiaries.

Labor—Scranton Electric and IBEW-AFL agree to 7% wage increase retroactive to July 1 upon WSB approval . . . One day walkout ends at Detroit Edison as the wage dispute is handed to a three-man fact finding commission set up by Gov G. Mennen Williams. UWUA is asking for 15¢ per hour pay increase, union shop, and additional benefits. Company has offered 4¢ an hour raise plus 3¢ an hour boost based on the cost-of-living and subject to revision every three months.

Public Relations—Du Mont Television Show, "Meet the Boss," on which Bayard L. England, president of Edison Electric Institute, appeared on Aug. 19, will be seen by kinescope in San Francisco (KPIX) on Sept. 16, in Pittsburgh (WDTV) Sept. 21, in Baltimore (WAAM) Oct. 1, and in Philadelphia (WFIL) on a date to be announced.

Congratulations—Alabama Power elects Milton H. Fies vice president in charge of mining and W. M. Wade vice president in charge of Southeast Division at Eufaula . . . Kellogg Switchboard & Supply elects William A. McCracken and Francis M. Parsons vice presidents . . . Eric E. De Marsh, sales manager of Burndy Engineering, has been named vice president in charge of sales.

WASHINGTON COMMENT

JESSE MOCK

West Coast audiences this week will have a chance to evaluate the three-week education of Gov Adlai Stevenson on federal power matters.

The Democratic presidential candidate is slated for a series of speeches in California, Oregon, and Washington this week and next. Insiders are certain he will discuss fully his views on federal development and transmission of electric power.

In a letter to an Oregon newspaper Aug. 16, the Illinois governor admitted public power "is one controversy where I need more education in order to work out a sound principle I can follow with confidence."

Chapman Playing Teacher . . . Since that time he has had the almost constant companionship and advice of Interior Secretary Oscar L. Chapman, an advocate of government paternalism in the power field. Already there is a small bit of evidence that Chapman is tutoring the candidate on the political facts-of-life as they pertain to the government's role in electric power matters.

Less than two weeks after admitting his lack of knowledge on the subject, the precise Stevenson felt qualified to criticize the power views of Republican candidate Dwight Eisenhower. He told reporters he was "sorry" to hear that the general evidently disapproves of public power development. This generalized and unsupported statement sounded more like Chapman than Stevenson.

Certainly Chapman has had the opportunity to impress his power views on Stevenson. For nearly a year now, Chapman has been in touch with the Illinois governor on a fairly regular basis. Since the Democratic convention, Chapman has taken up residence at the Springfield headquarters.

Ickes Taught Chapman . . . The Interior Secretary, a protege of the late Harold Ickes, is one of the top men on Stevenson's 11-man strategy board. He is in on all policy conferences involving more than three members of the Stevenson staff. There is reason to believe that he conducts at least part of his official duties from the Springfield location because he has had one of the Assistant Secretaries of Interior with him there part of the time.

Up until now, Stevenson has leaned toward limiting the role of the federal government. "I don't think government should compete with private business," he told a rural electric co-op convention which was held in Chicago early this year.

Stevenson's Views on Federal Transmission Unknown . . . Long-time acquaintances of Stevenson feel certain that the Illinois governor has no sympathy for a nation-wide network of valley authorities such as TVA. But they are less certain as to his views on federal construction of transmission lines from hydroelectric projects. It is in this crucial area that the Chapman influence may be most noticeable. Chapman has been militant in demanding that federal agencies should transmit as well as generate electricity.

Stevenson's western speeches this week should tell how much influence Chapman has been able to exert. At the same time, they will indicate whether Stevenson proposes to continue the power policies of the Truman administration.

Thus far the Illinois governor has tried to avoid any close tie-in with the White House. He recognizes the "time for a change" argument is one of the most effective he must combat. During this next week in the West, the Democratic candidate has an opportunity to say how much of a change he proposes in power policies. Outcome of this western tour may also decide Chapman's future in public life should the Democrats again capture the presidency.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Forgings for turbogenerator spindles have been defective to as high as 10% of production.

Gas turbine possibilities; (1) direct internal combustion of pulverized coal in the open-cycle gas turbine; (2) pulverized coal gasified under pressure in cyclone producer; (3) underground gasification of coal in thin seams.

Induction generators coupled with shunt capacitors for excitation make rugged and inexpensive generation for remote-controlled automatic hydro plants.

Hydrogen heated rather than cooled might help keep generator coils warm for a restart after a few hours shutdown.

Automotive torque-proportional differential transmits power to the two truck driving wheels in such manner that if one wheel begins to slip in soft ground the differential will deliver up to four times the tractive effort of the slipping wheel to the wheel with firm footing.

Polymer degradation of polyethylene when exposed to sunlight is greatly retarded (and life prolonged) by thorough dispersion of 2% of finely divided carbon black through the polyethylene.

Lead (99%) alloyed with antimony (1%) according to telephone experts is the best sheath material for all around service in cable sheaths.

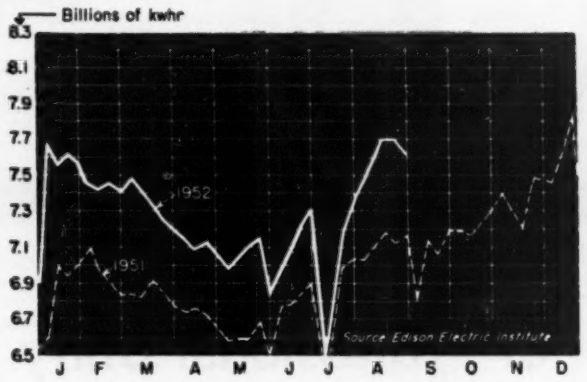
Plate circuit disconnection during idle periods will prolong the tube life in plant communication systems. Temperature will be reduced and life lengthened for other set components also.

High fidelity reproduction in plant communications systems may not be imperative because the low-pitched mumbles and high-pitched squeals (turbines and feed pumps) are likely to blank out the ends of the audio spectrum anyhow.

Time and motion studies are not necessarily for productive industry alone. The same principles of analysis could profitably be applied to new meter department layouts, transformer repair shops and even power plant machine shops.

Earth temperature under concrete pavement has been found 4 to 5 degrees lower than earth under asphalt.

STATISTICS



Output Week Ended Aug. 30—7,646,253,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Aug. 30	+7.0	+7.4	+3.5	+3.2	+7.6	+10.1	+9.8	+21.1	+7.8	+9.1
Aug. 23	+9.1	+7.4	+3.3	+6.4	+14.0	+15.4	+19.0	+9.8	+5.5	+6.9
Aug. 16	+6.5	+5.9	+1.8	+2.5	+10.7	+15.5	+11.4	+9.3	+1.4	+5.0

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	June	67.0*	65.9	62.4
Capacity (Million Kw)	July	77.61	77.46	72.70
Production (Billion Kwhr)	June	31.53	31.82	29.84
Hydro		9.16	9.69	8.02
Fuel		22.37	22.13	21.82
Fuel Consumption				
Coal (Million Tons)	June	7.66	8.01	8.06
Oil (Million Barrels)		3.91	3.72	4.54
Gas (Billion Cu Ft)		89.29	76.99	75.42
Sales (Billion Kwhr)	June	27.67	27.94	26.66
Residential		7.44	7.52	6.63
Commercial		5.00	4.74	4.55
Industrial		13.20	13.83	13.55
Other		2.03	1.86	1.93
Net Income Class A & B Companies ($ Million)	June	69.88	68.24	62.63
Estimated Dec. 52 Peak (Million Kw)	May	80.0	80.2	78.8
Kwhr per Residential Customer (12 Month Average)	May	2,078	2,066	1,909
Revenue per Kwhr Residential Service (12 Month Average)	May	2.78¢	2.79¢	2.85¢
Canadian Production (Billion Kwhr)	June	4.99	5.33	4.71

Business Statistics

FRB Industrial Production Index†††	July	192*	204	214
Gross National Product Annual Rate ($ Billion)	2ndQtr.	343.2	339.4	329.3
E. W. 5 Industry Production Index	June	96.9*	116.0	123.2
ENR Construction Cost Index††	Aug.	122.7	119.6	113.8
BLS Consumer's Price Index	July	190.8	189.6	185.5
NEMA Insulation Materials, Sales Index†	June	500	517	610
NEMA Electric Appliance Sales Index†	June	258	219	284
NEMA Household Refrig. Sales Index†	June	192	128	154
Metal Prices (Sept. 2)				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.16	.16	.17
Zinc, prime Western E. St. Louis, lb		.14	.14	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.03
Aluminum, ingot, base price		.20	.20	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Utility Construction of Structures and Facilities

During 1951 privately owned electric utilities added $1,319 million of construction to their systems.

Construction, as defined by the Department of Commerce, covers the erection, maintenance, and repair of immobile structures and utilities together with service facilities which become integral parts of structures and are essential to their use for any general purpose.

Structures include buildings, dams, storage reservoirs, levees, storage tanks, and transmission and distribution lines.

New Construction
Privately Owned Electric Utilities

(Millions of Dollars)

1915	92	1933	59
1916	117	1934	66
1917	123	1935	87
1918	102	1936	139
1919	156	1937	218
1920	262	1938	267
1921	163	1939	303
1922	229	1940	311
1923	412	1941	305
1924	463	1942	255
1925	421	1943	144
1926	362	1944	163
1927	362	1945	245
1928	338	1946	443
1929	350	1947	793
1930	377	1948	1,058
1931	225	1949	1,368
1932	109	1950	1,268

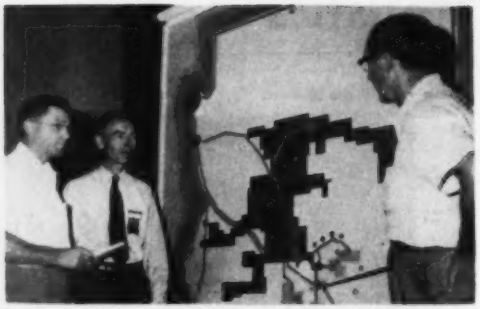
1951 1,319

Construction does not include special purpose equipment (turbines, generators, switchgear) designed to prepare the structure for a specific use or the installation of such equipment.

Clearing and development of land is a part of construction. It includes the cost of architectural and engineering fees, materials and service facilities installed, labor, and overhead.

Estimates of the value of new construction by privately owned electric utilities are prepared from annual reports to the Federal Power Commission by Class A and B companies. These reports are adjusted to exclude purchases of existing facilities and to allow for construction by small companies. It includes construction with Rural Electrification Administration funds.

TAKING TIME OUT for a chat at the AIEE Pacific General Meeting are (left to right) T. M. Morong, Salt River Power District; P. H. Light, GE; and H. A. Holmes, formerly with Monongahela Power



SERVICE AREA of Arizona Public Service Co is described for Hendley Blackmon, Westinghouse Electric and Donald A. Quarles, AIEE head, by Henry Sargent (right), president of Arizona PS

AIEE to Strive for Professional Unity

Quarles tells Pacific meeting institute will keep in forefront of movement. Circuit breaker tests, safety discussed

Donald A. Quarles, addressing the American Institute of Electrical Engineers at its Pacific General Meeting for the first time as president of the organization, declared his administration would be very much interested in the problems of professional unity and would keep the institute in the forefront of this movement.

The meeting was held in Phoenix, Ariz., Aug. 19-22 and its chief topics of discussion were high-voltage circuit breaker testing, operation of carrier current equipment, and safety in power system operation and design.

Problem . . . Quarles said the immediate question in the move toward unity was whether to go along with the "first-step" recommendations of the 15-engineering society exploratory group or to hold out for a more satisfactory "first step." The group's recommendations include a broadening of the membership in Engineers Joint Council and constitutional changes to effect a closer-knit organization.

AIEE's president emphasized, however, that the institute will not lose sight of the fact that its basic interest is technical.

Transmission and Distribution . . . An urgent need exists for early adoption of a revised standard test code wherein computed test results covering operation of high-voltage circuit interrupting equipment will reflect faithfully actual duty imposed. This was indicated in a paper, "Field Tests on 135-kv, 315 3.5 million-kva, Low-Oil-Content Circuit Breakers," by Paul Wildi and Lloyd Morgan, both of Pacific Oerlikon Co, Tacoma, and W. H. Clagett, Bureau of Reclamation, Denver, and subsequent discussion.

By controlling the timing sequence to impose maximum interrupting difficulty and arcing time on the breaker, it was believed more severe conditions of gas pressures, shock and physical stress were obtained in the interrupting element than by the earlier "random-shot" method. Considering test equipment and facilities available, it was felt that optimum severity was reached.

Estimating Severity . . . For an approximation of severity of duty, Prof E. C. Starr, Oregon State University, has suggested multiplying the arcing time by the crest current in the final loop.

R. C. Van Sickle, Westinghouse Electric Corp, East Pittsburgh, Pa., in pointing out the difference between testing and rating, said one test does not establish a rating. To insure getting the greatest stress and difficulty, a series of tests is necessary.

A. G. Boyd, General Electric Co., Philadelphia, remarked that successful tests on breakers using a current wave with a moderate rate of rise do not mean equipment will meet other conditions.

Conclusions drawn by R. C. Van Sickle in his paper "Switching of High-Voltage Capacitors" included: Switching of high-voltage shunt capacitor banks under normal conditions, with parallel banks on the same bus, can produce surge currents up to 70 times normal; high recovery voltages appearing slowly across on interrupting device makes interruption of capacitor currents difficult and can cause restrikes; restriking transients usually cause no damage through overvoltage but can cause flashovers above 14.4 kv; overvoltages during interruption can be reduced or eliminated through modification of the breaker.

Microwave Applications . . . Major problems concerning use of carrier current on long lines were presented by O. Mangum, Reclamation Bureau, Phoenix. Most serious problems are adjacent channel and harmonic interference and cross-coupling and interference from additional carrier equipment on interconnected lines, he said. It is hoped that channel spacing and frequency reassignments, plus installation of very selective, narrow band-pass input filters in receivers, will minimize interference. Further, Mangum hoped carrier current manufacturers will consider production of narrow band-pass filters in packaged units for installation on existing and new equipment.

Another problem is loss of output from transmitters for telemetering where output of several units must be connected in parallel. In this case, use of the recently announced rf hybrid

coils appears as a satisfactory solution. On long lines involving several bypasses, use of long coaxial cables into the station is not satisfactory because of excessive signal attenuation. Use of a "high-impedance bypass" for such a condition at Parker Dam resulted in an average gain of 4/db in signal strength between Hoover Dam and Phoenix dispatching station. The bypass consists of an open wire telephone line connected to line tuning inductances in each bypass tuning unit. A similar bypass will be installed at Davis Dam.

In closing, the author stated a preference for built-in meters and a multipoint switching arrangement for cathode current and voltage readings over the use of jacks. One such installation has reduced maintenance time and has eliminated hazard of damage to expensive test equipment from careless selection of meter ranges. Because only relative values and not high precision are required, Mangum suggested that built-in test features might be included in carrier current equipment and at a reasonable cost.

Safety . . . The foreman or immediate supervisor is primarily responsible for safety in his department, said William Ismay, Arizona Public Service Co, in his paper "Who is Responsible for Safety?"

The company, he said, is responsible for a good environment—working conditions, tools, training, etc,—and the employee is responsible for a good and attentive attitude. But only the foreman can insure a maximum of safety by seeing that good working conditions and proper attitudes are maintained. However, it is up to the company to make it clear and definite to the supervisor that the primary responsibility for safety is his.

Safety begins on the designing board, declared E. C. Hunt, Pacific Gas & Electric Co. The designer must know what state and local safety requirements exist and the conditions they are designed to prevent. In view of the tremendous expansion underway today and the growing stress on economy, designers must strive to maintain minimum clearances, particularly on overhead lines, he said. They must take into account the vast difference between building a new line and changeout under energized conditions.

Hunt said if the power plant designer would consider the cost in time and labor that employees spend later on in improving safety features omitted for sake of economy, the designer might justify the cost in the original design.

Metering . . . Permanent and accurate records of generator frequency during fault conditions on the system are produced by the measurement system described in the paper "Wide Range Frequency Recorder and Indicator for Electric System Use" by F. S. Benson, late of Pacific Gas & Electric, and R. M. Stuart, General Electric Co. The system has a scale range of 20 to 70 cps and is substantially free of error due to wide variations of signal voltage amplitude within this frequency band. Basic component in the system is a stable electronic frequency convertor which produces a dc output linearly related to ac generator frequency input with a speed of response of about 0.4 sec.

One outstanding feature of this system is automatic changing of chart speed from 1½ in. per hour to 1½ in. per min when input frequency drops below 57 cps. Three generators at both Moss Landing and Contra Costa Steam Stations of PG&E have been provided with these systems and additional systems will be installed for future generators in these plants. It is felt that these frequency measurements systems will provide useful data.

Transformers . . . Wood louvers placed on four sides and on top of one of two 5,000-kva, 3-phase transformers resulted in an increased load of 90 kva over the unshaded unit without exceeding a hottest-spot temperature of 95/C. This was reported by S. A. Moore and W. J. Grasmoen, Salt River Power District.

The authors suggested that shading effects would not be lost and increased loading might be gained by providing more space between louvers and radiators to reduce chimney effect, by painting under portions of louvers black instead of aluminum to reduce reflection, and by eliminating top two rows of louvers to take advantage of random wind currents.

Summer Diversion at the Palisades

An important step in construction of Bureau of Reclamation's Palisades Dam near the Wyoming border in eastern Idaho has been completed. Engineers have diverted the Snake River into a new 1,450-ft channel sliced across a natural bend of the river.

This aerial photo looks downstream. The sharply sloping hill at left will become the dams' left abutment. The $76.6 million multiple-purpose project includes the 260-ft high dam and a power plant with installed capacity of 114,000 kw. First power is scheduled for early 1955.

6 PUD's Drawing Up New Plan

Washington public utility districts proceeding without Whatcom in developing proposal to buy Puget Sound facilities

As expected, six Washington State PUD's are going ahead without an earlier companion, the Whatcom County PUD of Bellingham, in developing a new plan for the purchase of the Puget Sound Power & Light Co of Seattle.

The new plan, eliminating Whatcom County electrical distribution facilities, is expected to reduce total cost of the purchase operation about $15 million to an even $100 million.

The participating PUD's are Chelan, Jefferson, Kitsap, Skagit, Snohomish and Thurston. The Snohomish and Chelan PUD's already own their distribution systems, hence would participate only in purchase of the transmission and generating facilities. With Whatcom out of the picture, each of the other PUD's will have to bear a bigger portion of the total financial load.

Offer Expected Soon . . . Harvey Benson of the Skagit PUD, chairman of the six-district executive board, said engineering data will be submitted to the commissioners of each district as soon as final details are completed. An offer may be made to Puget Power this month.

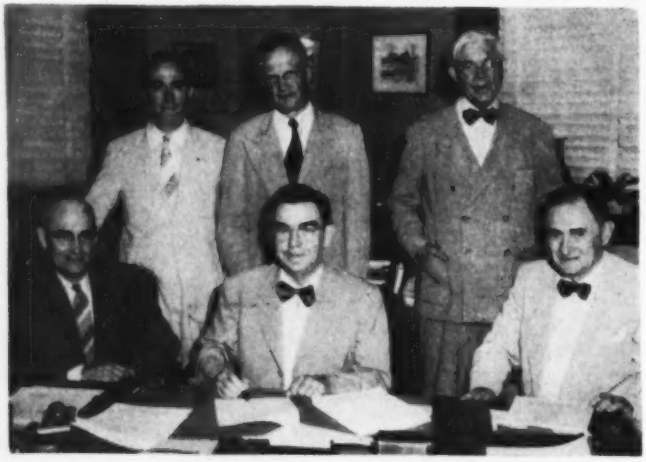
"It is important that the integrated power supply system of Puget be kept intact," said Benson in announcing the new proposal. "An over-all joint acquisition by the districts will preserve the economies of operating the generating plants as a pool."

Benson declared that the districts have a "firm commitment from Bonneville to furnish all additional power the districts may require in order to not only meet normal load growth but also to serve new industries.

No Regrets . . . Ernest W. Lennert, Whatcom PUD commissioner, expressed no regrets at Whatcom's being left out of the new purchase plan.

"In Whatcom County, we are opposed to the way things are being done, not to the overall acquisition," he said. "We're not trying to block the deal, but we feel the public is not being represented. There seems to be a lot of things that they don't want to get out to the public and they are afraid Whatcom County is going to bring them to light."

Commissioners of the other PUD's charged that Whatcom was not proceeding in good faith and seemed desirous of stalling the purchase plan.



Vepco Signs Kerr Dam Power Contract

Interior Department last week approved a contract between Southeastern Power Administration and Virginia Electric & Power Co for disposal of two-thirds of the power from John H. Kerr (Buggs Island) Dam on the Virginia-North Carolina line. Vepco will wheel power to preferred customers within a 150-mile radius for about 1.4 mills an hour. It will buy additional power from Sepa at $10.80 per kw per year and 4.5 mills per kwhr. The contract also provides for Vepco to firm up the output from the Kerr project.

Shown signing for Vepco is Jack G. Holtzclaw. He is surrounded by other officials of the power company who were involved in the negotiations.

Depa Doing Utmost to Aid Utility Program: Fairman

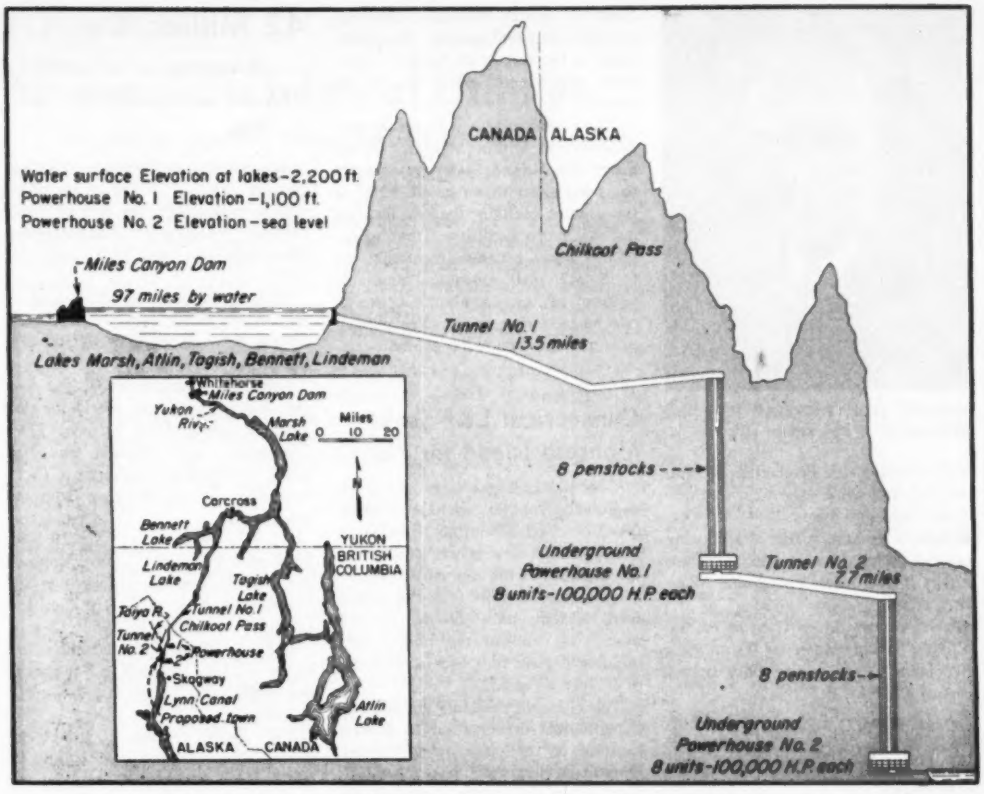
Admitting that there will be delays in completion of some new generating units in 1953 and 1954, James F. Fairman, head of Defense Electric Power Administration, said his agency is trying to hold the most essential projects on schedule and take slippage where reserve capacity is prospectively higher.

The Depa administrator made this statement in answer to a letter from Edison Electric Institute's president Bayard L. England, which warned that unless materials were made available there would be a delay in getting stations scheduled for completion in 1953 and 1954 on the line. (EW, Sept. 1, p 9). England called the lag in boiler production the major bottleneck in the utility expansion program and said the steel strike had aggravated the situation.

Fairman said "immediate and positive steps have been taken and will continue to be taken to assure the necessary flow of materials to all power projects in the order of their importance and to the extent of the availability of materials and manufacturing facilities."

Letters like the one England sent Fairman went to several other mobilization officials. Replies were received from R. A. McDonald, acting deputy director of National Production Authority, and John R. Steelman, acting director of mobilization.

In general they echoed the views of Fairman on the matter. McDonald also said there would be serious difficulties in making up lost boiler production caused by the recent steel strike.



This is the hydro installation Alcoa proposes to build for a new aluminum smelter on the Canadian border in Alaska. The question is:

Will Canada Go Along on Taiya Project?

Two weeks ago Aluminum Co of America announced it planned to build a $400 million smelter and hydroelectric project in the Taiya Valley district of Alaska's panhandle. Last week the proposal already had hit a snag.

As part of the plan, Alcoa wants to dam the Yukon River in Canada near Whitehorse, Yukon Territory. This would back up water to a power tunnel flowing under the international boundary at Chilkoot Pass in the Rocky Mountains. The water would drop to two underground power plants on the Alaskan side. Each plant would generate 800,000 hp.

Canada, it develops, is cool to the idea. Behind the coolness, probably, is what Canadians consider the shoddy treatment the United States recently gave Aluminum Co of Canada when it asked for a long-term procurement contract. Alcan's bid was turned down flatly in Washington.

Shuttling the Buck . . . Dominion and provincial authorities involved are kicking Alcoa's proposal back and forth between Ottawa and Vancouver, amid mutterings that the project would interrupt navigation on the Yukon. A company representative said Alcoa had approached both the Canadian and British Columbia governments before announcing its plan and received encouragement in the negotiations.

There's another hurdle on this side of the border. Alcoa wants to buy 20,000 acres of government land near Skagway for the smelter, power houses and a town site. Present land laws specify that only 160 acres of Alaskan land can be bought for industrial use. This means Congress would have to pass a law permitting the company to buy the additional land.

Alcoa says not only that it expects legislation to be introduced, but that it expects support from "very high sources" in Washington. Interior Department, however, which could be expected to introduce legislation concerning land under its control, says it has received no formal application from Alcoa for this. An aide to Secretary Oscar Chapman said he knew of no informal chats on the subject at that agency.

Alcoa officially outlined its Taiya

ALCOA's LEON HICKMAN: "We have been advised by high defense officials . . ."

Project to Defense Production Administration last May. The plan (see diagram) runs like this:

- Build a smelter capable of producing initially 200,000 tons of aluminum annually in the Taiya Valley near Skagway, Alaska.
- Dam narrow Miles Canyon on the Yukon, backing water up 93 miles in five lakes to the mouth of a tunnel east of Chilkoot Pass.
- Carry water under the Rockies at the international boundary through two power tunnels with a combined length of 21 miles.
- Drop water 2,200 ft in two stages to the underground power plants.
- Transmit power to the nearby smelter to produce aluminum from refined ore.

"Alcoa is acutely aware of the long-range importance of such a program to national defense," Leon E. Hickman, vice president and general counsel, said in announcing the company's plan. "We have been advised by high level defense officials that a project of this type is highly desirable."

Biggest consideration in building the power plants underground is the possibility of enemy attack. The smelter itself would be above ground, built partially into the side of a mountain and sheltered by other high mountains in the area.

The Joint Chiefs of Staff have given a green light to the project, even though it is in an avenue of possible ground action. The site is considered to be "very defensible," against both land and air attack, officials indicated.

Four Years . . . Alcoa officials estimate the plant would take four years to build. It would eventually offer employment to 4,000 persons. This would make it the largest in Alaska to provide employment every day in the year.

The company says it wants to start construction within a year. It has asked the United States government for permission to write off 50% of the cost of building the smelter, but not the hydro facilities, in five years. It also wants a commitment that the U. S. will give Alcoa an "equitable portion" of any new aluminum stockpile business that arises when current procurement contracts expire.

Connecticut L&P Seeks Manresa Island for Plant

Connecticut Light & Power Co is negotiating for the purchase of Manresa Island, offshore from Norwalk, as the site for a new power plant. For the second time the company has again run into protests from residents. Stamford citizens have fought for 21 months to prevent the utility from building a plant on Cove Island there (EW, July 14, p 122).

The Norwalk residents are forming a permanent organization to prevent location of the plant on the island. Opposition is expected to reach a high point when the matter comes up before a municipal zoning authority.

Manresa Island lies about 2,400 ft off shore and is owned by the Roman Catholic Society of Jesus.

Sherman Knapp, president of Connecticut L&P, said the society is reconsidering an offer to sell because of the public interest value of the plant.

The company declined to say whether or not it would abandon plans for construction of a plant at Cove Island if the Norwalk site can be purchased.

Editorial Abstracts Available

Abstracts of 40 selected technical papers presented before the International Conference on Large Electric High-Tension Systems (CIGRE) held in Paris, May 28-June 7, have been prepared by editors of Electrical World. For copies write: Electrical World, Editorial Department, 330 West 42nd St, New York 36, N. Y.

42 Million Kw . . .

. . . is announced officially by DPA as added capacity goal by 1956

The nation's new electric power expansion goal is 117 million kw of installed capacity by the end of 1955, Defense Production Administration announced last week (EW, Aug. 18, p 7).

This would mean the addition of 42 million kw to the capacity of Class I utilities between the first of 1952 and the end of 1955.

Official announcement of the new goal came after three weeks of discussions among DPA Defense Electric Power Administration, and National Production Authority. There were few changes resulting from the discussions.

Expansion Proposal . . . DPA proposes the expansion be accomplished at approximately these rates: 7 million kw in 1952; 10 million in 1953; 12 million kw in 1954; and 12 million kw in 1955. Also included in the goal is one million kw to be installed early in 1956.

The figures reflect a stretch-out during this year and next compared to the expansion goal DPA announced March 22 (EW, March 24, p 109). At that time DPA proposed installation of 9 million kw in 1952 and 11 million kw in 1953. The goal announced in March was from a three-year, 32 million-kw program. This latest is for a four-year, 42 million-kw program.

The Reason . . . Main purpose in announcing the new program is to extend the rapid tax amortization program to facilities to be in-service in 1955. Under DPA regulations, rapid amortization is applicable only to facilities within the expansion goal figures.

It is hoped that the new goal will facilitate allotment of sufficient materials to carry out the kw program.

Power to supply atomic energy commission facilities accounts for about 6.5 million kw—some 15% of the planned power expansion.

Class I utilities, for which the revised goal has been established, produce about 95% of the total energy used by the public. The group does not include industrial power plants and some small public utilities.

FINANCIAL

Financial Stability of Utilities . . .

. . . stressed by Bayard L. England in talk to security analysts. EEI head says private ownership of the industry is assured

The good management and vigor of the electric industry make utility securities attractive and assure its future under private ownership, Bayard L. England told a group of financial experts last Friday.

Speaking before the New York Society of Security Analysts, the president of Atlantic City Electric Co and Edison Electric Institute listed a number of factors which will attract capital to the utility field in the years ahead. Chief among these, he said, is able leadership.

Stress Leadership . . . "The electric utility companies are aware of the grave importance of leadership and . . . are devoting much more attention to the selection, training, development, and inspiriting of personnel for all leadership posts in these companies," England told the analysts. The job of expanding service, raising capital, getting along with government agencies demands leadership of high quality, he added.

Although competition with government power has been tough and unfair at times, England said, many companies are negotiating workable relationships with the federal and local governmental bodies. He called this period critical but predicted, "Once it is successfully passed, the tide of socialized power will go no higher" barring a complete upheaval in American institutions.

Clarification of Issue . . . Since much of the potential water power of streams in most of the country will have been developed either by private utilities or governmental agencies in a few years, he pointed out that government power advocates would have to campaign for steam plants to advance plans for socialized power. The issues then between private and public power would be clearly drawn. England feels the advantage would be with the utilities and private enterprise.

With a rise of tax burdens on individuals and businesses Americans will be more inclined to support moves to make local governmental proprietary enterprise and cooperatives be taxed like other business, the utility president said. This has already happened in Britain, he said and stated that without the subsidy public power will be more expensive than private power.

Continued Growth . . . Another factor which makes utility securities a good buy, said England, is prospect of continued growth of demand for electricity. The industry, he feels, has demonstrated an ability to finance the expansion needed to meet increased demand for power. Since World War II the investor-owned companies have spent $11,750,000,000 on plant expansion and plans call for increasing this figure to $18 billion by the end of 1954. These figures compare with an investment in plant and equipment of about $14.5 billion at the end of World War II and were cited by England as proof of the industry's ability to raise money for expansion.

Other Factors . . . Other policies of electric utilities which contribute to the industry's financial stability listed by England were:

- Well-designed rate structures.
- Area development activities.
- Willingness to give customers the best possible service.
- Growing understanding between company managements and regulatory commissions on questions relating to rates and other regulatory matters.

PUD Contract Talks

In the July 7 issue of Electrical World it was erroneously stated that Okanogan County PUD was considering buying the properties of Ferry County PUD in Okanogan and that Ferry PUD was in debt to Nespelem REA.

Actually the two PUD's discussed a contract. Ferry PUD felt it should have a contract with Okanogan PUD stipulating the amount of money Ferry has invested in facilities in Okanogan County. Okanogan agreed not to parallel any of Ferry's lines.

FINANCIAL BRIEFS

Benton-Lincoln Electric Cooperative, operating in western Oregon, has purchased the Idanha Power Co for $60,000 . . . **City Council of Jacksonville, Fla.** has given unanimous approval to a bill calling for issuance of $18 million in revenue bonds which will come before the voters in a referendum on Oct. 7.

Jersey Central Power & Light Co's construction expenditures of $1.9 million during the month of July were the highest in the company's history.

Home Light & Power Co, of Colorado, has placed with The Mutual Life Insurance Co of New York $500,000 of 3¾% first mortgage bonds, due in 1982.

Scranton Electric Co is planning to sell $7.5 million of first mortgage bonds to take care of an estimated $13 million construction program which will run through 1954.

Pennsylvania Public Utilities Commission has approved the sale of Metropolitan Edison Co's office building in Reading to American Casualty Co, Reading, for $1,125,000. Metropolitan Edison plans to construct a new building on Pottsville Pike, one half mile north of Reading.

Green Mountain Power Corp and City Electric Department of Burlington, Vt. have been considering the possibility of the city purchasing GMP's distribution system in Burlington for about $1 million and leasing the city's new steam plant of about 27,000 kw to GMP for seven and one-half years beginning in January 1954 at $185,000 a year rental.

REGULATION

Hartford Electric Light Co plans to set up residential rates involving use of fuel charge adjustments when it gets commission approval.

Nova Scotia Public Utilities Board has approved an overall rate increase of 4.4% to customers of Dominion Utilities Co and Eastern Light & Power Co, both operating on Cape Breton Island.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Aug. 28	**2.96**	**3.01**	**3.16**	**4.09**	**4.27**	**4.62**	**5.24**	**5.57**	**6.06**
Aug. 21	2.97	3.02	3.16	4.08	4.27	4.62	5.25	5.57	6.11
2nd 1952	2.95	3.00	3.09	4.06	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.06	4.27	4.61	5.52	6.24	7.05

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
Alabama Power	12	July	$11,530,030	$10,440,439	.....	.....
Arizona Public Service	12	July	2,651,233	2,072,149	.....	.....
California Pacific Utilities	12	July	516,245	450,895	1.93(a)	1.71(a)
Citizens Utilities	12	June	370,119	302,852	.43	.35
Dallas Power & Light	12	July	3,724,270	3,304,753	.....	.....
Detroit Edison	12	July	15,678,693	15,610,401	1.60(b)	1.74(b)
Georgia Power	12	July	11,257,254	9,197,201	.....	.....
Gulf Power	12	July	1,862,375	1,102,266	.....	.....
Houston Lighting & Power	12	July	7,794,818	6,520,389	.....	.....
Kansas City Power & Light	12	July	5,261,882	4,492,200	.....	.....
Mississippi Power	12	July	1,949,382	1,728,517	.....	.....
Pacific Gas & Electric	12	July	41,574,535	36,287,336	2.40(c)	2.23(c)
Southern Co and subsidiaries	12	July	19,406,800	16,147,600	1.13(c)	.99(c)
Tampa Electric	12	July	1,950,834	1,864,943	3.17(c)	3.12(c)
Texas Electric Service	12	July	7,709,747	6,780,193	.....	.....
Virginia Electric & Power	12	July	11,701,547	10,040,684	1.80(f)	1.76(f)
Washington Water Power	12	June	3,802,041(g)	3,151,430	.....	.....

Notes—(a) Based on average of 222,969 shares outstanding in 1952 and 204,489 shares in 1951; (b) Based on 9,772,628 shares in 1952 and 8,983,263 shares in 1951; (c) Based on average number of shares outstanding; (e) Based on shares outstanding at end of each period; (f) Based on average number of shares outstanding for period—*before* giving effect to extraordinary reduction in federal income tax; (g) an estimated provision of $30,000 for wage increase from May 1, 1952 was made in June 1952, actual payment pending approval of WSB.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF AUGUST 28-SEPTEMBER 3			
None Scheduled			
WEEK OF SEPTEMBER 4-10			
Bonds			
Arkansas Power & Light—1st mtg 1982	$15,000	.....	.....
SCHEDULE FOR SEPTEMBER TO DECEMBER			
Bonds			**Bid Date**
Duquesne Light—1st mtg 1982	$14,000	.....	Sept. 22
Pacific Power & Light—1st mtg 1982	7,500	.....	Sept. 22
Central Illinois Public Service—1st mtg 1982	5,000	.....	Sept. 23
Appalachian Electric Power—1st mtg 1982	17,000	.....	Sept. 23
Washington Water Power—1st mtg 1982	30,000	.....	Sept. 30
California Oregon Power—1st mtg 1982	7,000	.....	*
Utah Power & Light—1st mtg 1982	10,000	.....	Oct. 15
Carolina Power & Light—1st mtg 1982	20,000	.....	Oct. 20
Virginia Electric & Power—1st mtg 1982	20,000	.....	Oct. 21
Long Island Lighting—1st mtg	20,000	.....	Nov. 18
New Orleans Public Service—1st mtg 1982	6,000	.....	Dec. 15
Notes			
Appalachian Electric Power—serial 1956-1967	$8,000	.....	Sept. 23
Preferred Stock			
Duquesne Light—140,000 sh $50 par	$7,000	.....	Sept. 15
Central Illinois Public Service—50,000 sh $100 par	5,000	.....	Sept. 23
Columbus & Southern Ohio Electric Co—80,000, sh $100 par	9,000	.....	Sept. 17
Common Stock			
Utah Power & Light—167,500 sh (to be offered to stockholders on 1-for-10 basis, record Sept. 5 to expire Sept. 25; stockholders to be allowed over-subscription privileges)	$.....	.....	.....
Long Island Lighting—599,942 sh	.....	.....	#
California Electric Power—350,000 sh	.....	.....	## Oct. 1
California Oregon Power—250,000 sh	.....	.....	*
Columbus & Southern Ohio Electric—300,000 sh	.....	.....	.....
Idaho Power—225,000 sh	.....	.....	.....
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Central Hudson Gas & Electric—1st mtg 1982	$5,500	.....	.....
Alpena Power & Light—1st mtg	1,700	.....	.....

* Bids to be opened during first two weeks of October.
# Blyth & Co, First Boston Corp and associates, underwriters. ## Merrill Lynch, underwriters.

CALENDAR

Centennial of Engineering
Convocation, Chicago, Ill., Sept. 8-13.

American Standards Association
National Standardization Conference in conjunction with Centennial of Engineering, Museum of Science-Industry, Chicago, Ill., Sept. 8-10; 34th Annual Meeting, Waldorf-Astoria Hotel, New York, Nov. 19.

Edison Electric Institute
Area Development Institute, Yale University, New Haven, Conn., Sept. 8-10; Accident Prevention Committee, Sheraton Hotel, Rochester, N. Y., Sept. 15-16; Prime Movers Committee, Roosevelt Hotel, New Orleans, La., Oct. 6-7; AEIC joint meeting, Meter-Service Committees, Mayflower Hotel, Washington, D. C., Oct. 6-8; Electrical Equipment Committee, Roosevelt Hotel, New York, Oct. 13-14; Transmission - Distribution Committee, Hotel Adolphus, Dallas, Tex., Oct. 23-24.

Illuminating Engineering Society
National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 8-12.

Instrument Society of America
7th National Instrument Conference-Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 8-12.

National Association of Corrosion Engineers
Short Course on Corrosion in cooperation with Washington University, St. Louis, Mo., Sept. 8-12.

Pennsylvania Electric Association
Annual Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 16-17; Fall Meeting, Electrical Equipment Committee, Irem Temple Country Club, Dallas, Pa., Oct. 2-3; Transmission - Distribution Committee, Penn-Alto Hotel, Altoona, Pa., Oct. 9-10; Fall Meeting, Systems Operation Committee, Hotel Roosevelt, Pittsburgh, Oct. 16-17; Industrial Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 23; Fall Meeting, Meter Committee, Fort Stanwix Hotel, Johnstown, Pa., Oct. 23-24; Fall Meeting, Relay Committee, Robert Treat Hotel, Newark, N. J., Nov. 13-14.

Northwest Public Power Association
Accounting Section, Congress Hotel, Portland, Ore., Sept. 18-19.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 18-19.

Public Utilities Association of the Virginias
Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 19-20.

Southeastern Electric Exchange
Fall Meeting, Engineering - Operation Section, Biltmore Hotel, Atlanta, Ga., Sept. 25-26; Accounting Conference, Jung Hotel, New Orleans, La., Oct. 16-17; Sales Conference, Thomas Jefferson Hotel, Birmingham, Ala., Oct. 29-31.

Missouri Valley Electric Association
Accounting Conference, Hotel President, Kansas City, Mo., Sept. 29-30; Sales-Rural Conference, Hotel President, Kansas City, Mo., Oct. 8-10.

California Municipal Utilities Association
20th Annual Conference, U. S. Grant Hotel, San Diego, Sept. 30-Oct. 3.

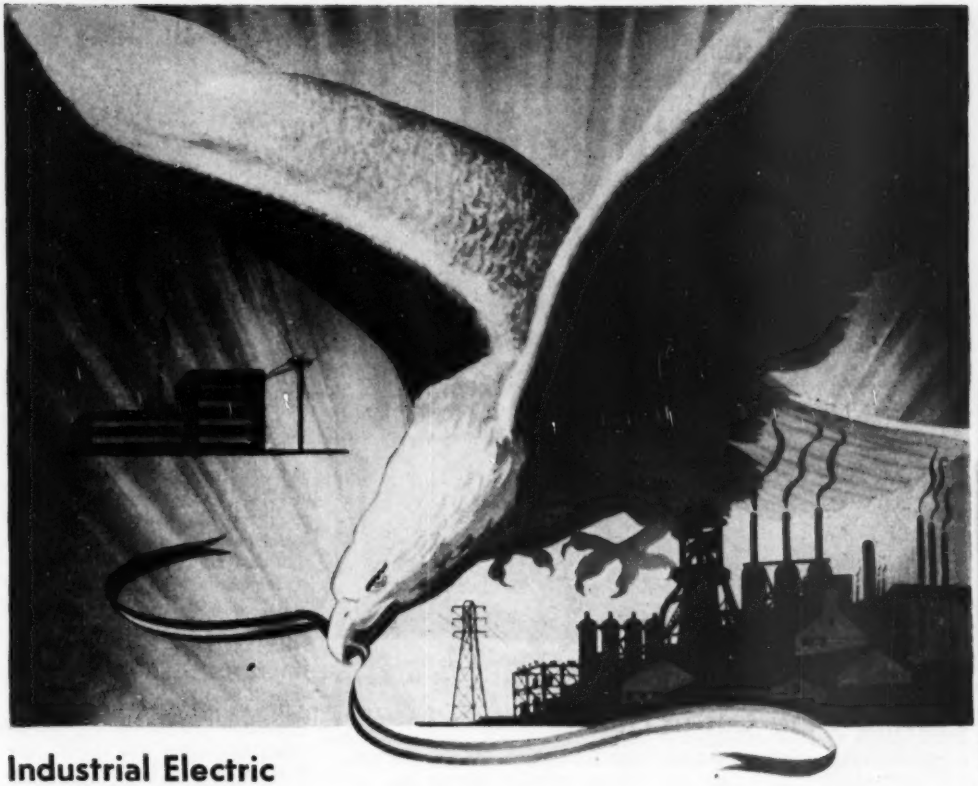
Wisconsin Utilities Association
Convention of Technical-Sales Sections, Schroeder Hotel, Milwaukee, Oct. 1-3.

International Association of Electrical Leagues
17th Annual Conference, Radisson Hotel, Minneapolis, Minn., Oct. 1-4.

University of Texas
Power Distribution Conference, Department of Electrical Engineering, Austin, Oct. 6-8.

***American Institute of Electrical Engineers**
Fall General Meeting, Jung Hotel, New Orleans, Oct. 13-17.

*Addition this week.



Industrial Electric Heating Builds

Production for Freedom

Utility company power sales departments are showing more and more interest in electric heating. They realize that the industrial heating load is worthwhile. They know that it can be profitably served and they know that it will grow in importance as new heating applications are developed.

The size of the electric heating field offers unbelievable possibilities. A. D. Spillman, Supervisor of the Market Studies and Application Division of the Philadelphia Electric Co reports that in the metal sheath heater field alone, there are in excess of 10,000,000 kw of heaters installed for industrial use. In 1951, sales were of the order of 1,987,000 kw, representing approximately $15,896,000 in equipment sales. Possibly 25% were for replacements. If manufacturers and utilities cooperate the potential revenue of the metal sheath heater market to utilities is equivalent to 50% of the present industrial sales. With adequate promotional effort in the next 10 years, this should approximate $750,000,000 annual revenue from the 240,880 manufacturing industries in the U. S.

Today, of the total dollar volume of electric and fuel-fired furnaces sold, (excluding melting and induction furnace equipment), nearly one-half are electrically heated.

Electric arc melting furnaces installed have an ingot capacity of about 7,000,000 tons annually, which is approximately 7% of the total ingot making capacity of the United States. At an average assumed value of 500 kwhr per ton and an arbitrary rate of 1¢ per kwhr, this represents an annual electric revenue of $35,000,000. With the present day greater trend to electric melting and to furnace sizes up to 25,000-kw capacity, we may anticipate tremendous revenue increases.

Electric heat is still in its infancy, but it has already opened many large and new profitable markets. Today the applications of electric heat are so numerous that many of the newer applications are not recognized by industry or by utility company power sales engineers. For this reason Electrical World has assembled on the following pages a number of case installations in which electric heat has accomplished an unusual or outstanding job, solved a difficult heating problem, and demonstrated real customer benefits. To see these new and unusual jobs, please turn the page.

Production for Freedom

Strip Heaters

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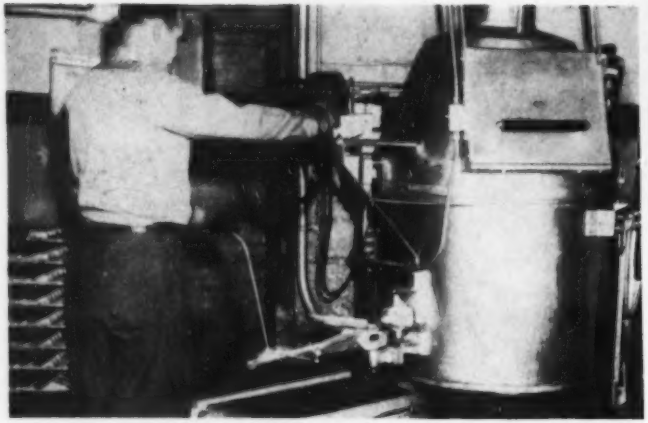


ELECTRIC RE-HEAT POT reduces labor costs $25.00 weekly and eliminates overtime. Operating cost is less than that of formerly used gas fired pot. Working conditions are improved

Casting Time Cut in Half

F. W. VARNEY, Salem Electric Lighting Co, Salem, Mass.

The recent installation of a 2-ton capacity, 30-kw, 220-v, 3-phase re-heat pot at the Salem Evening News, Salem, replaced original gas fired equipment. According to Mr. Keyser of this firm, who is very enthusiastic about this new equipment, it has the following advantages:

Casting time was cut in half, reducing labor costs approximately $25.00 per week and also eliminating overtime. New pot has better temperature control, eliminating cold shuts in the castings. Production was increased by use of a gravity-fed water cooled twin 8-mould. Original equipment had to be hand-pumped and could only make two castings at one time. Cost of operating the 30-kw pot is less than that of the gas fired pot. New pot operates with no fumes and has improved working conditions of employees.

General Electric Co

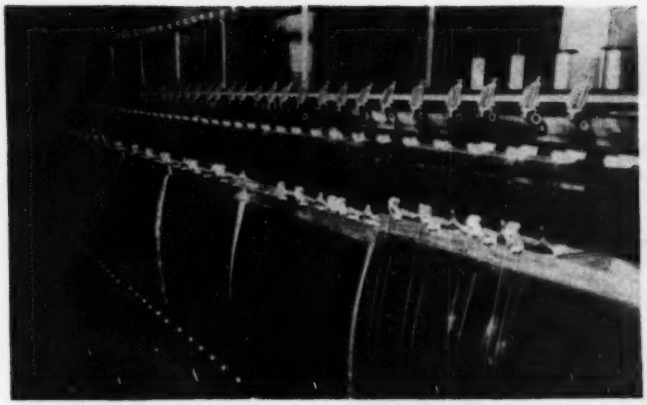
Keep Presses Moving

Fourteen hundred high temperature tubular heaters keep a battery of 24 hydraulic moulding presses in continuous operation at the Precision Rubber Products Corp, Dayton, O. The firm takes raw rubber and moulds it into hydraulic "O" rings used in automobiles, trucks, aircraft, and farm machinery. A number of 675-ton, 250-ton, and 75-ton hydraulic presses operate at 300 F and turn out several million rings per month, varying in size from 1/32 in. to 22 in. inside diameter. Straight lengths of heaters are set parallel in the press grids, and the voltage of each is varied to provide uniform heat throughout.

Controlled Heating Improves Gun Bluing

Heating and accurately controlling temperature of a salt solution used for bluing rifle sights with electric strip heaters at the E. C. Herkner Co, Boise, Idaho, saves man-hours, cuts rejects due to rust, and produces a better quality product. Working conditions are better than with former method using gas burners under tanks controlled manually by watching thermometer. Gas method gave erratic temperatures and produced fumes and water vapor.

Tanks are of steel construction 12 in. square and 14 in. deep. Liquid is 10 in. deep and has to be heated to 300 F. Temperature must be held at this point for period of bluing, otherwise rusting of parts results. Tanks were converted to electric operation by installation of 5800 w of electric heat using 8 in. 500-w strip units (two vertically on each of all four sides) and one 1800-w ring unit on the bottom. Entire tank was insulated with 1½ in. fibre glass board insulation. A 3-heat switch is now used for control but it is planned to eventually convert to hydraulic type thermostat. The entire affair is portable. It is connected for 230-v operation using a tyrex cord with grounding wire. Earl E. Haroldsen, Idaho Power Co, Boise, Idaho.



CURVED PANELS of stainless steel, with strip heaters attached to the undersides, dry silk thread evenly and completely at speed of 10 yd per min. Thread passes twice over steel panel

Unique Panels Dry Thread Evenly

The problem of drying silk thread evenly was solved at the Corlis Mfg Co, Allentown, Pa., broad silk weaving plant, by the use of strip heaters under curved stainless steel panels. Like other textile plants, this company found themselves with a problem in weaving skein dyed silk yarns after weaving rayons and acetates for many years.

The exfoliation of the silk threads caused an undesirable condition, which could be remedied only by proper sizing of the thread. The problem arose in the drying of the thread before being wound on the bobbin. Threads, which were not completely dry when woven, caused the cloth to crinkle or be of a pebbled nature due to the uneven drying.

Since suitable equipment was not available on the market, a curved stainless steel panel 37 in. by 31 in., to the underside of which a 1000-w strip heater was attached, was used as the drying medium.

Using the steel panel as the face of the unit, the rear and sides were enclosed in a boxlike structure and fully insulated. After the thread passes through the gelatin and wax emulsion, it is passed twice over the steel panel where it is completely dried before being wound on the bobbin. Six threads pass over each of nine panels at 10 yd per min. Photograph shows the installation of the 9 heating panels on the winder. As yarn was being changed on the machine at the time the photograph was taken, the thread was installed only on the end unit to illustrate the operation of this unique equipment.

After several months of satisfactory operation, the volume of business necessitated increasing the speed of the machine. To increase the number of passes of the thread over the panel seemed a logical solution of drying with the increased machine speed; however, the additional friction and tension caused breakage and uneven winding. Further experimentation on one unit indicated that the only change required was to increase the heating load to 1500 w. The thread now travels 20 yd per min and is completely dried. A change in the other eight units is now in progress. The 9-kw load is supplied from a 3 phase, 220-v circuit and operated 16 hr a day.

P. J. BRITT, Industrial Representative, Pennsylvania Power & Light Co, Allentown, Pa.

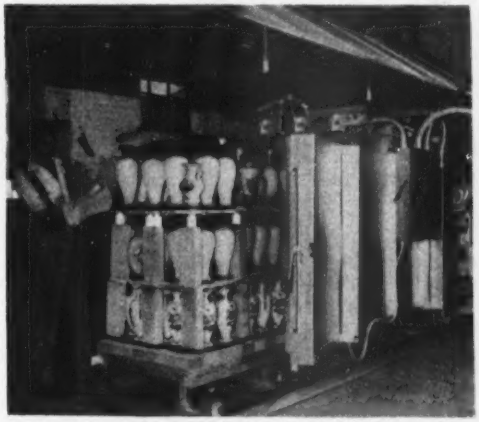
Electric Kilns Cut Ceramics Firing Time

THOMAS J. FOY, Industrial Engineer, Philadelphia Electric Co

The installation of two 60-kw electric kilns for glazing and firing ceramic lamp bases saves time and increases production at the Winston Lamp Mfg Co, Philadelphia, Pa.

Of unique design, the kiln housing is mounted on wheels and provided with doors at each end, permitting firing one load while another is being loaded onto another base. There is no need for waiting a long time for the kiln to cool sufficiently for a worker to reach into or enter the kiln after a firing cycle is completed. Additional time is saved by the preheating of each load through heating units installed in the bed upon which the ceramic pieces are stacked. As high as 150 lamp bases constitute a single load for a kiln.

Firing is done at temperatures up to 1400 F over a 5 hr period. The kiln cannot be opened until temperature has dropped to 650 F. This requires approximately one hour. A double-throw switch permits operation of either one of the two kilns and at the same time limits the electrical demand to 60 kw. It also permits continuous operation.



NOVEL KILN HOUSING mounted on wheels with doors at each end permits firing one load of ceramic lamp bases while another is loaded

Infrared Heating

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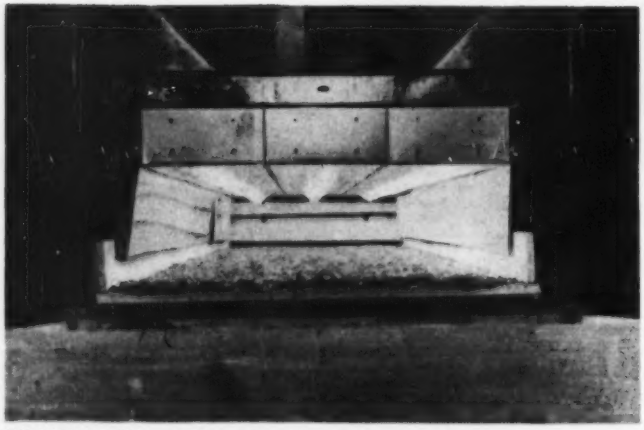


TOBACCO DRYING with 12-kw infrared lamp bank mounted over inclined conveyor belt results in overall saving of 33%. Tobacco is blown into far end of conveyor, travels length of dryer and drops into storage boxes. Drying time is decreased and waste is reduced 15%

Saves 33% In Tobacco Drying Costs

E. W. SCHLEICHER, Industrial Engineer, Metropolitan Edison Co, York, Pa.

An overall saving of 33% is made by use of infrared lamps for complete drying of tobacco by W. J. Neff & Co., cigar manufacturers, Red Lion, Pa. Drying time is decreased, fewer man-hours required, waste reduced 15%.

It is essential that short filler tobacco be properly dried prior to storing, in order to eliminate possibility of rotting or formation of mould. In most instances gas, steam, or air drying has been used. W. J. Neff & Co previously used air drying which entailed spreading tobacco over the floor and turning it at regular intervals. After three or four days the tobacco was suitable for storing.

This process was unsatisfactory because of the floor space required and the amount of labor involved. An economical solution was found in this compact, 12-kw bank of infrared. Unit is made up of 12-500-w and 24-250-w infrared bulbs mounted horizontally over an inclined, vibrating conveyor belt. Tobacco is fed from the cutters or scrap machines onto the conveyor, and the concentrated heat of the 500-w bulbs starts the drying action. The speed of the conveyor varies, depending upon the moisture content and type of tobacco being dried. Drying time varies from 1 to 4 min while output of the unit averages 100 lb of properly dried tobacco per hour. All this is accomplished regardless of atmospheric conditions.

Insures Accurate and Even Mat Shrinkage

TOM GUNTER, Industrial Engineer, Central Power & Light Co, Corpus Christi, Texas

The Corpus Christi, Texas, Caller-Times has built an infrared drying cabinet which has eliminated uneven shrinkage of their matrices while partly drying with moist heat.

According to A. T. Blease, Caller-Times mechanical superintendent, the cabinet is built of aluminum and contains a shelf which is adjustable to the face of the matrice to receive the proper amount of heat from the lamps. Nine 250-w, 120-v infrared lamps are mounted on this shelf, and they are controlled by an electronic timer. The timer is set for one minute operation, which gives ¼-in. accurate shrinkage at this stage of drying. Company formerly dried their mats in a flame-type oven which gave them uneven shrinkage and brittle spots which caused trouble when placed on the casting machine.

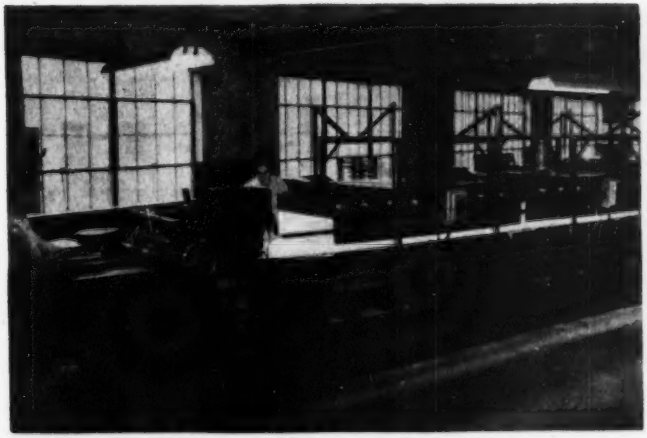
DRYER equipped with nine 250-w infrared lamps gives ¼ in. accurate shrinkage of matrices. Former gas oven gave uneven shrinkage and brittle spots

Moisture Removal Problem Is Solved

WALLACE F. BLACKFORD, Electrical Design Engineer, Line Material Co, Milwaukee, Wisc.

Preheating insulating transformers (used for airport runway lighting units) at Line Material Co, E. Stroudsburg, Pa., with battery of twelve 375-w infrared lamps in gold plated reflectors removes all moisture and effects a better seal with the hot compound. The formerly-used blow torch method was slow and did not provide uniform heat. All moisture was not removed and the compound became volatile and boiled off—leaving it lumpy. Transformers are heated in their castings for two hours prior to filling them with insulating compound. Compound is heated in electrically heated 4400-w pitch pot having ¼-hp motor for stirring compound. An additional 250-w infrared lamp is used to keep compound from clogging outlet pipe of pot. After filling with compound, transformers are again placed under the infrared lamps for about 25 minutes to prevent too rapid cooling and to aid in removing bubbles from compound.

REMOVING MOISTURE from insulating transformers by preheating with infrared lamps provides better seal with hot compound. W. F. Blackford watches workman fill transformer with compound



INFRARED TUNNEL has cut time required to dry glue on bindery material to 45 sec. Former method of air drying required hours, oftentimes days. Production costs have been cut

Tunnel Dries Glue In 45 Sec.

J. R. TAYLOR, Duquesne Light Co, Pittsburgh, Pa.

Glue-on bindery material at Allegheny Bindery Corp, Pittsburgh, Pa., is dried in approx 45 sec with infrared heating. Former method of air drying required hours, oftentimes days, depending upon weather conditions. Production has been stepped up, plant efficiency has been improved and production costs have been decreased. In addition to reducing drying time, infrared heating has released floor space for other purposes because it is no longer necessary to store material while drying. It has also eliminated a considerable amount of hand work which was formerly necessary.

Bindery material or advertising sheets are simply placed on the continuous belt of the machine at one end of the tunnel where glue is applied. It is dried by 36-kw infrared lamps during short trip through tunnel, emerging at other end completely dried.

An electric strip heater keeps the rolls of the machine at a uniform temperature. Strip heaters are also used to heat glue pots. Thermostatic control of heaters maintains glue at proper viscosity for most efficient application to material.

Window Frame Paint Dried in 8 Minutes

Drying paint on Bonderized steel window frames is accomplished in 8 minutes at the Rusco Co, Bethlehem, Pa., using a 36-kw infrared oven. Previously 16 hours was required for air drying. Oven has released valuable space previously required for air drying area. K. M. Entsminger, Industrial Rep, Pennsylvania Power & Light Co, Bethlehem, Pa.

Ovens & Furnaces

☆ ☆ ☆

Die Casting Rejects Cut Below .5%

L. B. REED, Ind. Power Consultant, Dept of Water & Power, City of Los Angeles

Fourteen new electric furnaces have been installed at McCulloch Motors Corp, Los Angeles, said to be largest U. S. magnesium die casting producer. They replace gas-fired furnaces formerly used but found undesirable. Maintenance was a problem because the corrosive effects of the fumes necessitated frequent repair to mechanically and electrically-controlled valves and sensitive gas-air regulators. In addition, the gas-fired furnaces operated practically side-by-side with induction aluminum furnaces, making it possible for employees to compare their operation and working comfort. Naturally, the electric furnaces provided very much cleaner and considerably cooler working areas, and they became the preferred working stations for employees.

The new furnaces not only eliminated the valves and regulators which had given the maintenance trouble and the corrosive effects of the sulphur dioxide, but also the surplus dome, required for fire protection. Bottled sulphuric dioxide is now bled over the surface of the metal, with the consumption of sulphurdioxide reduced to one-twentieth the amount formerly used. Rejects due to temperature variation have been cut to less than .5% because of cleaner metal and elimination of porosity. Better temperature control has also increased production, since it is no longer necessary to stop die casting operations as they had done when the temperature went beyond a safe maximum, the complete readjustment period requiring about 25 min.

Three 80-kw furnaces are installed for metal breakdown, nine 20-kw furnaces for holding molten metal at each die casting machine, and two 20-kw transfer furnaces used for distributing molten metal.

RESISTANCE POT FURNACE (80-kw) for melting die casting magnesium has better temperature control than formerly used gas fired furnaces. Production has been increased since operations are continuous (without 25 min stops caused by overheating—experienced with former gas furnaces)

Saves Time and Labor

Melting brass with 125-kw rocking-type arc furnace of 390 lb capacity is a major factor towards increased production of brass castings at Fort Meter Box Co, Wabash, Ind. With electric furnace the first heat is available in 45 min each morning and succeeding heats at 30-min intervals. Formerly with two fuel-fired furnaces it took over 3 hr to get out the first heats each day. Improved working conditions and better materials handling enable one man to operate furnace room with 75% increase in metal per day as compared to former operation using two men. R. A. Scholl, Ind Power Eng, Public Service Co of Ind., Inc, Kokomo, Ind.

Makes Better Castings

Melting metal in an arc-type melting furnace at the G. & W. Foundry, Rehoboth, Mass., provides high quality high-alloy gray iron castings, reduces smoke and fire hazard, and provides accurate temperature control. Furnace is 200 kw and handles 850 lb per melt. 180 kva of capacitors improve power factor. G. B. Newton, Power Sales Eng, Attleboro Steam & Electric Co, Attleboro, Mass.

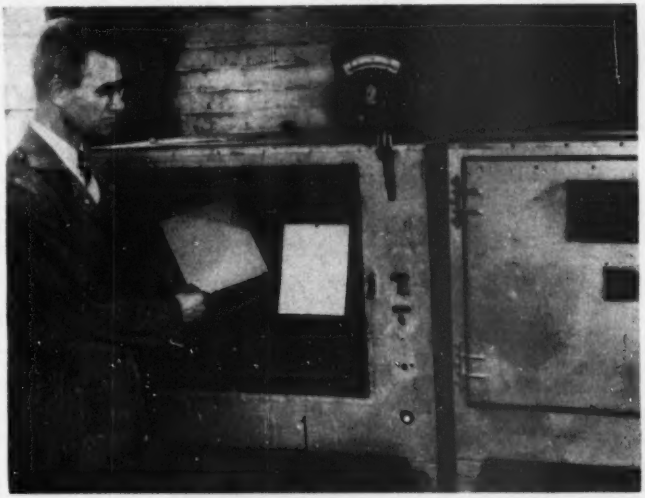
Bakes Better Cores

Core baking in a 32-kw electric oven at the United States Gauge Co, Sellersville, Pa., provides accurately controlled heat and more satisfactory cores. Formerly they baked cores in a propane gas heated oven at their main plant. Due to need of additional space by other departments for large defense orders, foundry was moved to another location. This move presented an opportunity for the sale of equipment for conversion to electric operation. This was done by installation of 32 kw oven heating. P. J. Britt, Ind Rep, Penn Power & Light Co.

Ovens Aid Test Baking of Paints and Coatings

J. F. **RICHARDSON**, Industrial Sales Engineer, Cleveland Electric Illuminating Co, Cleveland, Ohio

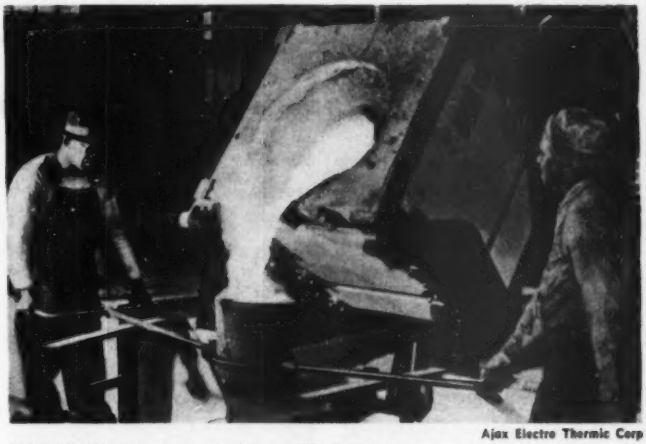
Electric ovens do a perfect job of test baking at the Benton-Climo Co, Cleveland, Ohio, manufacturers of a wide variety of protective coatings and industrial finishes and paints, according to J. P. Walsh, technical director of the company. Walsh says "With their automatic controls you just set 'em and forget 'em. Drying starts and stops at the time set. There's no combustion to spoil an experimental finish." Bakery consists of two 2400-w electric drying ovens. A test panel of a proposed baking finish is placed in one of the ovens and subjected to the same heat that the finished batch must undergo after the finish is applied to a product and is baked in a drying oven. Results of the timed bake prove the presence or lack of the desired properties in the batch.



BAKE OVENS speed tests of hundreds of industrial finishes every year. Combustion-free electric heat won't harm finishes subjected to same heats finished products will undergo

Castings More Uniform

Aluminum melting with induction furnaces (total load 140 kw) at Parker White Metal Co, Erie, Pa., on four of their die-casting presses has reduced rejects and produces more uniform castings with finer grain structure in the metal. This is due to the closely controlled metal temperature. Better ventilation improves working conditions in the die-casting room, due to lower radiation losses of the electrically heated pots. Longer pot life is obtained in these furnaces than with formerly used fuel fired equipment. G. W. Cannon, Industrial Engineer, Pennsylvania Electric Co, Erie, Pa.



Ajax Electro Thermic Corp

POURING high-alloy stainless steel from a 2000-lb high frequency induction furnace. Minimum of external heat and fumes, improves working conditions. Melting is so rapid that there is practically no metal loss through oxidation

Eliminates Scale

Copper brazing at Automatic Machine Products Co, Attleboro, Mass., with electric furnace provides accurate temperature control and a scale-free finished product. A 30-kw, 208-v, 3-phase, conveyor-type furnace with an overall length of 30 ft is used to copper braze certain parts to refrigeration valves. Atmosphere protection is provided by insulated generator using city gas. The furnace operates at 2050 F, 24 hr per day, and processes 400 valves per hour. George B. Newton, Power Sales Eng, Attleboro Steam & Electric Co, Attleboro, Mass.

Save $6,000 A Year Melting Steel

Used to melt stainless steel at the Cooper Alloy Foundry Co, Hillside, N. J., this high frequency induction furnace saves up to 20 lb of chromium per 1000 lb melt. The difference . . . some $6,000 a year for the four induction furnaces operated by the company . . . represents metal that formerly oxidized during the relatively slow melting of other types of furnaces. High frequency induction furnaces melt so rapidly that there is practically no metal loss through oxidation.

Improved working conditions are another asset, as these furnaces produce a minimum of external heat and fumes. Installation consists of a 350-kw motor-generator set, operating two 2000-lb furnaces, and 175-kw set, operating two furnaces of 1000 lb and 500 lb, respectively.

Production for Freedom

High-Frequency Heating

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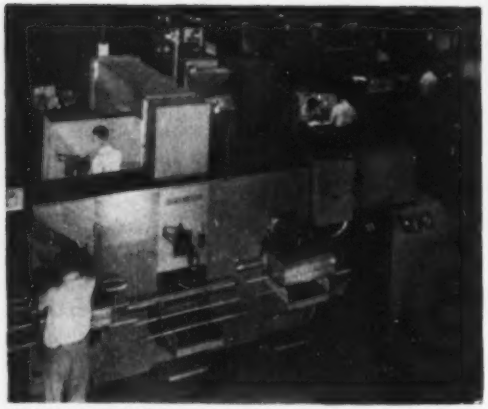
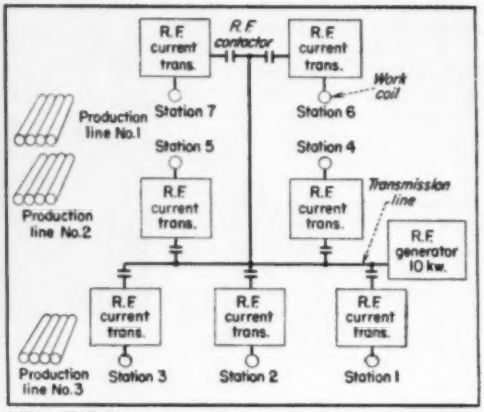


SOLDERING OPERATION with induction heating on gasoline tanks for trucks is done in 4 to 11 sec—a fraction of time required to solder by hand. Less solder is used. Joints are more consistent



WORK STATION arrangement for induction heating soldering equipment is in three lines to accommodate production of several different types of tanks. Each station has its own current transformer

Induction Heat Improves Gas Tank Soldering

JOHN A. REDMOND, Electronics Division, Westinghouse Electric Corp, Baltimore, Md.

Induction soldering produces more consistent joints in gasoline tank fittings for trucks at International Harvester Co, Fort Wayne, Indiana. Each soldering operation is performed in from 4 to 11 sec—a small fraction of the time required if done by hand method. Also, less solder is used.

The equipment consists of seven work stations. An operator successively moves a tank from one station to another, where each of the several fittings is soft soldered automatically. All stations are interlocked so that each takes its proper turn without attention by the operator and gives a nearly 100% duty cycle on the 10-kw r-f generator.

Each of the seven work stations has its own current transformer. Each station also has its own r-f contactor which connects the current transformer onto the transmission line. The transmission line is a special low-impedance line constructed to minimize the voltage drop from the r-f generator to the extreme end of the line.

Control circuits are so arranged that only one work station may be heating at any one time, but while the fitting at one station is heating and cooling the operator can be loading and unloading other stations. An indicator light at each station shows when power is available.

Work stations are arranged in three lines to accommodate production of several types of gas tanks.

On Station #3, the fill neck is soldered onto a gas tank. The gas tank is then moved to Station #2 and a gauge plate is soldered to its top. The tank is then turned over and placed on Station #1 where the drain plug is soldered into the bottom of the tank. The time necessary to melt the solder in these applications varies from 7 to 11 sec. A cooling time of 50 to 60 sec is required to allow the solder to set. Four other types of tanks are also soldered on Stations 3, 2, and 1. These other tanks have the same type of fittings.

On Station #5 a suction plate is soldered to one gas tank. The tank is then moved to Station #4 where the drain plug is soldered. The other half of this tank (which is made in two parts) is handled at Stations #7 and #6. On Station #7 a fill neck is attached; on Station #6 a gauge plate is soldered to the tank.

On the front of the main frame of each soldering position is mounted a counter-weighted carriage that rides up and down on roller bearings. When this carriage is pushed down, it locks into position. A gas tank is then loaded onto the carriage. A slight push releases the lock and the carriage raises the gas tank up into the work-coil where it is positioned by a stainless steel guide rod that passes through the center of the work-coil. The operator has merely to guide the tank until the rod engages the hole in the center of the fitting to be soldered. The carriages that carry the gas tanks up into position are adjustable for accomodating various tank shapes. The work coils are also adjustable so that the coil will always be parallel to the gas tank.

Metal Melting Efficiency Increased Up to 75%

Induction melting at the Attleboro Refining Co, Attleboro, Mass., has increased efficiency of operation from 15 to 75%. Cooler, cleaner, and less smoky working conditions and decreased fire hazard have been further benefits.

An oil-fired furnace was formerly used to melt non-ferrous metals, such as gold on copper, gold on nickel, etc, preparatory to refining. Replacement is a h-f motor-generator unit with a 100-kw generator and nose tilting furnace capable of melting 600 lb.

Generator is driven by 150-hp, 230-v, 3-phase motor. 200 and 300-lb crucibles are also available to lend flexibility to the operation. Normal production schedule calls for six melts per day. G. B. Newton, Power Sales Engineer, Attleboro Steam and Electric Co, Attleboro, Mass.

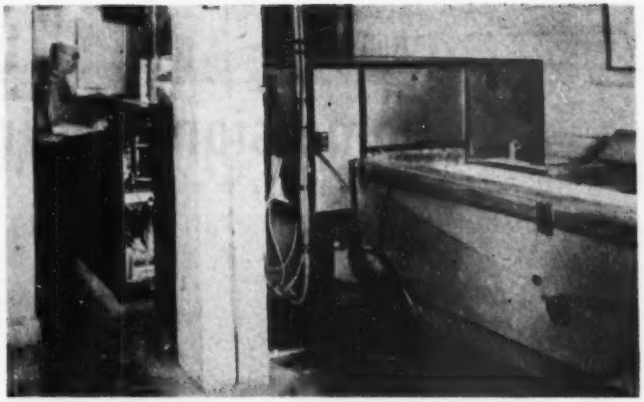
Glue Setting Time Cut to Minutes

Glue setting with a 30-kw dielectric unit at the Sensenich Corp, Lancaster, Pa., cuts setting time to minutes. Former air drying method required hours. Approximately 300 sq ft of floor space was saved. Strips of hardwood are glued together to form table tops, work benches, and kitchen cabinet work surfaces. W. F. DeLong, Industrial Representative, Pennsylvania Power & Light Co, Lancaster, Pa.

Production Costs Cut 50%

Plastic bonding of plastic hunting license holders is speeded by dielectric heating at the Williamsport Die and Machine Co, Williamsport, Pa. Output has been increased materially and the production costs have been reduced 50%.

According to test, "electronic stitching" has greatly improved the quality of these holders and some additional products are being developed that will employ this process. Two 7-kw, 230-v units have replaced a bank of sewing machines which were formerly used for the production of these holders. Kenneth H. Breon, Industrial Representative, Pennsylvania Power & Light Co, Williamsport, Pa.



GLUING and edge bonding cores and shelves for kitchen cabinets with r-f heat cuts time required to seconds from 3 hr previously. Man-hours and rejects are reduced and operating cost has been cut approximately 25%

Plywood Output Increased 400%

WM. A. GUHR, Power Salesman, Luzerne County Gas & Electric Corp, Kingston, Pa.

A 10-kw radio frequency generator installed at the Davis Millwork Co., Forty Fort, Pa. has increased output 300 to 400%. Generator does double duty (1) gluing and edge bonding cores and shelves for kitchen cabinets and (2) gluing and curing plywood. In the first operation a hydraulic edge bonding and gluing press does the work in seconds as compared to 3 hr previously required. The second operation glues and cures about 100 pieces of plywood in from 10 to 30 min, cutting time from 3 to 4 hr as previously required. Man-hours and rejects have been reduced and operating cost has been cut approximately 25%. The operation is much cleaner and faster and employee working conditions and morale are better. Quality of work is improved and bond is stronger.

Converts Ingot to Liquid in 5 Min.

F. A. KENDER, Industrial Sales Engineer, Cleveland Electric Illuminating Co

INDUCTION FURNACE melts steel in 5 min with extreme flexibility, less dross, almost no oxidation, excellent temperature control, high efficiency and better working conditions. Furnace is 50 kw. Picture shows worker adjusting lens of optical pyrometer used to measure intensity of light radiation from molten steel

More than 100 steel alloys, plus some copper and aluminum, are melted with induction heat at Midwest Precision Castings Co., Cleveland, Ohio. According to W. C. Jenkins, general manager, metals can be melted without making extensive adjustments. Besides the extreme flexibility and high melting speed, there is less dross, almost no oxidation and excellent temperature control. Temperature of metal is held within plus or minus 25 F. Metal is poured into molds when temperature reaches 3000 F. Melting operation is repeated every 5 min. Furnace is powered by a 50-kw converter which changes 60 cycle to 9600 cycle. Converter unit is driven by a 90-hp electric motor. The mold making department has four electric furnaces for heating molds.

Immersion Heating

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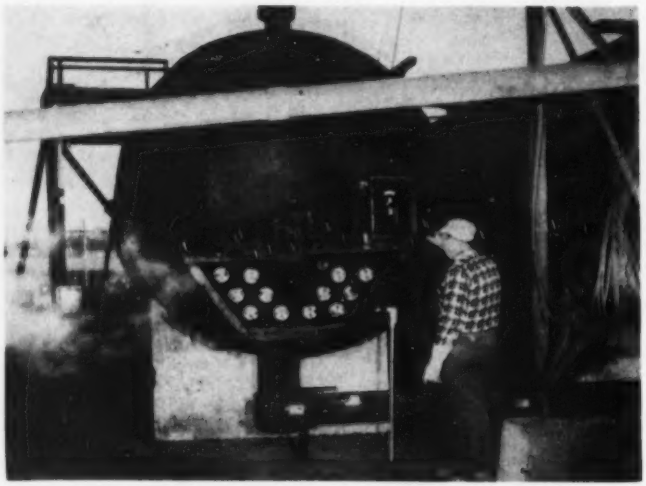

ASPHALT STORAGE TANK has twelve 3-kw, 10-ft long, special tubular immersion heaters and time clock control

Maintain High Production Efficiency

A. D. SPILLMAN, Supervisor, Industrial Applications Section, Market Studies & Service Division, Philadelphia Electric Co

Electric heaters have overcome the many difficulties experienced with the formerly-used steam heating method for heating asphalt at the James D. Morrisey, Inc., plant located in Philadelphia.

High production efficiency is maintained, temperature control is accurate and quality of asphalt produced is uniform.

For many years asphalt was heated in huge storage tanks by means of steam supplied from fuel-fired boilers. Other requirements to heat interconnecting pipe lines, mixers, etc, were also accomplished with steam. In many cases the steam presented problems. Lack of sufficient pressure slowed the heating of asphalt, deliveries were delayed, and uniformly heated asphalt which is essential for good mixes could not be relied upon.

Various types of electric heaters have been applied for bulk heating, heating pipe lines or mixers. Automatic controls make possible the maintenance of specific temperatures throughout the operations. Asphalt plants in our territory have found that asphalt temperatures of 325 F produce the most uniform quality of paving material.

The recently installed Morrisey plant is capable of producing 400 to 700 tons of hot asphalt per day. The electric heating load in this plant amounts to 183 kw, which is in addition to its 280 hp in motors for pumps, mixers, rotary driers and miscellaneous devices.

The electrically heated equipment, automatically controlled, consists of the following:

Three 10,000 gal insulated storage tanks, each equipped with 12 special, 10 ft long, tubular immersion heaters of 3 kw each.

The total connected load of these three storage tanks is 108 kw. The mixer is heated with tubular metal sheath heaters (12 kw). The weighing bucket is heated with tubular metal sheath heaters (4 kw). The insulated pipe lines at the bottom and the top of the storage tanks and the pump equipped with metal sheath heaters rated at 10 kw. The fuel oil used for heating the rotary driers, which dry the sand and stone, is preheated with standard immersion heaters grouped to represent a total connected load of 49 kw. The total electric heating load is 183 kw.

In some cases hot asphalt, at temperatures of about 250 F, is delivered to these mixing plants in insulated tank trucks or cars. The temperature of the asphalt is then raised to 325 or 350 F in storage tanks from which it is piped to the weighing bucket and then mixed.

The electric heating load, of unity power factor, may establish a 30 min demand equivalent to 50% of its connected load. The overall monthly consumption for lighting, motors and electric heating may range from 200 to 350 hr use of the demands, depending upon production.

At the Morrisey plant, a time clock control permits heating the asphalt in the three storage tanks at night. This takes place after the heavy motor load for mixing and handling drops off.

Paint Heating Cuts Truck Painting Time

Heating Paint before spraying cuts out-of-service time for painting to a minimum for trucks and trailers at Joice Motor Lines, Charlotte, N. C. Paint is heated to approx. 160 F with 110-v 250-w element before spraying. It spreads more uniformly because spray is finer and only one coat is required. Finish is much glossier and drys hard within 30 min. Less material is required, reducing cost of repainting. Company is well pleased with the quality of work as well as with saving in time. E. R. Davis, Power Engineer, Duke Power Co, Charlotte, N. C.

Air Heating

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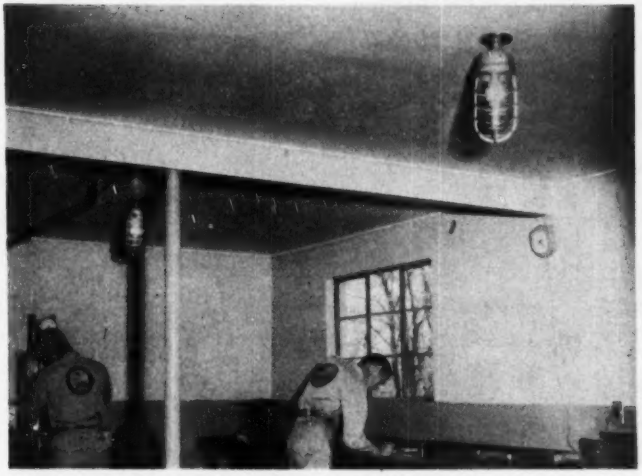


CEILING HEATING PANELS eliminate danger of explosion due to accumulation of dust particles. Large size heating area produces necessary heat at relatively low temperature concentration. Painted panels blend with adjoining sheetrock

Unit Heaters Cut Heating Costs

Unit heaters in 10, 15 and 20-kw units (total of 585 kw) are used to heat this 822,000 cu ft manufacturing building at the Southern Electrical Corp, Chattanooga, Tenn. The cost of heating (assuming added use to kwhr used for manufacturing) was from $2,200 to $3,000 per season with weather varying from 2800 degree days to 3200 degree days. Customer figures labor saving alone would pay for heating cost. Formerly more than $3,000 was spent for coal to heat building. Cleanliness is a much greater advantage than was at first estimated. W. G. Davies, Chief Power Sales Eng, Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Panels Reduce Explosion Hazards

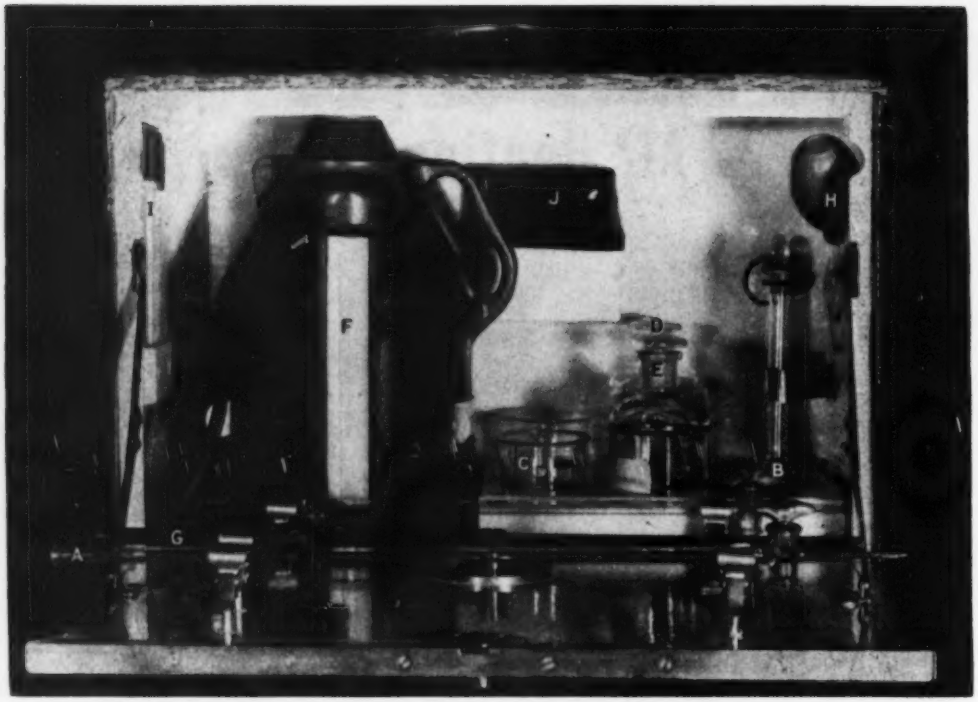
L. M. VAN ZANDT, Texas Electric Co, Forth Worth, Texas

"We wanted a heating installation that did not require moving air or that would be exposed so that explosive dust could accumulate on the units. This is the reason we chose ceiling-mounted electric heating panels," says Mr. Reginald Robinson, manager of the Research Center of Welex Jet Services, Inc, Arlington, Texas. At the research center, explosive "Jet" charges, which are used to perforate the lower section of oil well casings, are loaded. If dust particles were allowed to accumulate in crevices along the wall, there would be danger of explosion. A heating area of sufficient size to produce the necessary heat at relatively low temperature concentration was needed.

The appearance of the ceiling-mounted heating panels is very similar to sheetrock gypsum board. In this installation the panels were joined by sheetrock, and then the entire ceiling covered with texture paint. The result is a smooth surfaced ceiling and walls with no place for dust to collect. The only indication of a heating installation is the thermostat mounted on the wall to control room temperature.

The only other possible solution would have been to use steam heat. Due to the location of the Research Center, the only possible fuels for the boiler would have been butane gas or oil. A boiler room would have been required with an attendant to care for it.

The Research Center is divided into nine rooms with a total area of 1,566 sq ft and the total connected load for the heating panels is 22.5 kw. Even though the outside temperature recedes to 13 F, the employees working inside the building are comfortable. Mr. Robinson believes that the advantages of this type heating far outweigh the operational costs.



OIL TESTS KITS for determining both neutralization value and color in the field are similar to that shown and consist of the following:

(A) 2 funnel-top, 10-ml burettes graduated to 0.05 ml
(B) 2 Cassia flasks having a volume of 100 ml to the lowest mark on the graduated neck and a neck volume of 10 ml between the lowest and highest mark
(C) 2 150-ml beakers
(D) A sample of oil of known acidity for comparison purposes
(E) A stock of approximately 1/10 normal potassium hydroxide (KOH) solution
(F) A stock of solvent consisting of methyl alcohol, distilled water, and phenolphthalein
(G) A demountable burette support
(H) Droppers for adjusting the levels of the solvent and the oil in the Cassia flask
(I) Stirring rods
(J) A Hellige Pocket Color Comparator calibrated in Union Color numbers from 1 through 8

Condition of Used Insulation Oil Judged by Field Screening Test

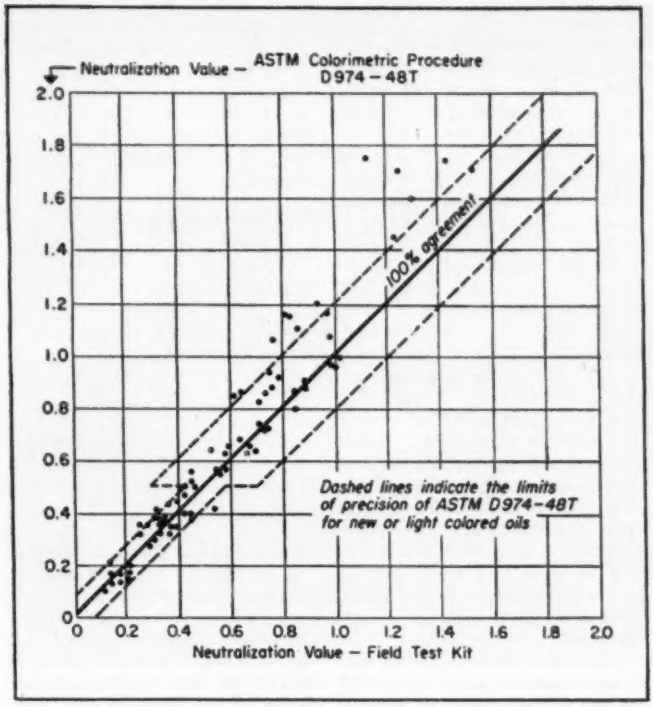
More comprehensive testing in the laboratory has gradually become necessary to permit used insulating oils to be accurately judged. There was need for a simple field procedure to show the condition of an oil so that samples of only those oils in doubtful condition would need to be tested in the laboratory.

This article describes the plan adopted by the American Gas & Electric System for classifying oils as to serviceability. This phase of the problem would be a first step by any utility in endeavoring to determine the extent of its oil reclamation needs.

Useful oil life is a function of many factors including temperatures to which the oil has been subjected, whether or not oxygen has had access to it, and the materials which have contaminated it such as insulation varnishes, bushing compounds, or core lamination coatings.

Although the presence of a small amount of sludge on the windings of a transformer is not an indication that this equipment is in hazardous condition, it does indicate that it is only a matter of time before the sludge will affect transformer availability and that preventive maintenance may be due.

Field personnel were made responsible in 1938 for making dielectric tests and sending to the system's General Laboratory samples of all oils which showed, in addition to low dielectric, evidence of sludge or had a sour odor or dark color. Laboratory tests indicated about 40% of these oils could be put into acceptable condition merely by blotter pressing. Also it was observed that the neutralization number, color, and power factor values and a visual examination for evidence of sludge would provide a good basis for screening tests for insulating oils in the field. Consequently field test



COMPARISON OF 100 TESTS for neutralization value made with field test kit and by ASTM color indicator titration finds most of results within limits of precision

R. G. CALL and **W. L. WEBB**

Mechanical Engineering Division, American Gas & Electric Service Corp, New York, N. Y.

Opinions differ on whether maintenance of insulating oil presents a problem or not. The authors' company recognizes that a problem exists and has developed procedures designating which oils should receive laboratory study

kits for neutralization value and color along with oil cells for measuring power factor were given to crews which make field power factor tests on bushings.

Screening Limits . . . To permit making general classifications of used oils in the field, test value limits were set to designate:

1. Oils suitable for continued service
2. Oils in doubtful condition

Each field insulation test crew which makes the screening tests on oils completes the circuit in its assigned area about every three years. Hence, an oil classified as "suitable for continued service" normally would be retested and reclassified every three years.

Samples of those oils classified as "in doubtful condition" are sent to the General Laboratory for more comprehensive tests and for recommendations on what attention the oil should receive. Practice followed in judging such oils were published previously.

The initial screening limits, which if any one characteristic was exceeded would denote that the oil should be more thoroughly examined, were as follows:

Neutralization Value	0.7 mg of KOH per g.
Color (union)	7
Power Factor (20C)	1.0%
Visual evidence of sludge	

These limits were used up to 1950.

About 25% of the samples sent to the General Laboratory had been put into the "doubtful condition" class because of power factors of about 1% when all other characteristics were acceptable.

These power factors in the majority of cases could be restored to normal simply by filtration through laboratory filter paper, indicating that moisture was present in a sufficient amount to affect power factor but in an insufficient amount to lower the dielectric below the acceptable value. When this condition existed, the power factors never exceeded 2%.

During the latter part of the period up to 1950, samples exceeding the limits on neutralization value or color or showing the presence of sludge were rarely received from operating companies that had been giving attention to their oils. The reason is that many of the oils had been reclaimed or otherwise restored to acceptable condition. The time, therefore, had arrived for revising the screening limits to give greater assurance that oils indicated to be satisfactory by the screening tests actually were suitable for continued service. These limits were changed in March 1950 to the following:

Neutralization Value	0.5 mg of KOH per g.
Color (Union)	5
Power Factor (20C)	1.75%
Visual evidence of sludge	

Conclusions . . . During the past ten years approximately 2,600 oil samples representing some 1,250,000 gal. of oil have been field tested. The following data show how this oil was classified by neutralization value:

Neutralization Value mg KOH/gram oil	Percent in Each Classification
Below 0.15	24.59%
0.15 to 0.30	40.94
0.30 to 0.50	25.83
0.50 to 0.70	5.86
0.70 to 0.90	1.58
Above 0.90	1.18

• "One System of Laboratory Testing to Appraise Serviceability of Oils in Transformers" by R. G. Call, Symposium on Insulating Oils, Spec. Tech. Bulletin No. 96, ASTM Committee D-9, March 22, 1949.

Of the total number of oil samples field tested about 325 were sent to the General Laboratory for further examination. Laboratory recommendations as to the attention to be given to the batches represented by these samples were divided as follows:

62% required blotter pressing only.

2% required special filtering to remove a silicate contaminant leached from core laminations.

28% required reclamation by fuller's earth.

8% were considered to be beyond salvaging.

In order to avoid laboratory analysis expense in excess of the value of the batch sampled, an arbitrary minimum batch limit has been set at 100 gal. Decisions regarding the disposition of batches of lesser quantity are made in the field.

It is apparent that suitable field screening tests for insulating oils save a great deal of laboratory work that otherwise would be required and permit more prompt attention to the batches of oil most urgently needing it. Consequently such tests form a vital step and, as previously mentioned, constitute one of the first steps demanding attention by utilities interested in insulating oil preventive maintenance.

Test Kit for Screening . . . In developing the test kit the determination of color presented no problem as equipment for this test was readily available. The big problem was to provide a simple means of measuring neutralization value with accuracy.

Then existing ASTM tentative standards involved a gravimetric-volumetric procedure conducted at near boiling temperature. As this method was impractical in the field, it was concluded that the best attack in devising field test equipment would be to develop a test method which would involve only volumetric measurements at ambient temperatures.

In brief, the plan adopted consists of titrations at ambient temperatures in which,

1. A factor designating the effective strength of the potassium hydroxide titrating solution is established on the basis of a given volume of an oil of known acidity as determined in the conventional manner.

2. Oils of unknown acidity are titrated with the same potassium hydroxide solution under the same conditions and their acidities are calculated using the factor determined under Step 1.

This procedure compensates for a change in concentration of the potassium hydroxide solution and depends only upon the acidity of the oil "standard" remaining constant.

The listed items, which are available at substantially all chemical apparatus supply houses, are either fitted into a carrying case about 12 in. by 24 in. by 18 in. high, such as the one shown, or a simple wall cabinet.

Test procedures for neutralization value and color follow.

Reagents . . . The following reagents are prepared in the laboratory and sent to the field:

A purified 98% methyl alcohol, distilled water solution (1:1 by volume) containing 0.2 grams per liter of phenolphthalein. Dissolve the phenolphthalein in the alcohol before adding the distilled water. Adjust the alcohol-water-phenolphthalein mixture to a faint pink color before each use by titrating it with the KOH solution.

Potassium hydroxide solution (approximately one-tenth normal).

Transformer oil of known neutralization value between 0.4 and 0.5 mg and a color preferably between 4 and 5.

Determination of KOH Solution Factor . . . To 100 ml of alcohol-water solution in a Cassia flask, carefully add 10 ml of the oil "standard," (oil of known acidity). **Do Not Shake.** Pour slowly into a 150 ml breaker and while pouring rotate the flask to wash the oil from from the neck of the flask.

With the glass stirring rod, agitate the oil-alcohol-water mixture in the beaker for two minutes. Titrate with the potassium hydroxide solution to a definite pink end point in the alcohol-water layer. The sample must be stirred vigorously while being titrated.

KOH solution factor =

$$\frac{\text{Neut. val oil std} \times \text{ml oil std used}}{\text{ml of KOH solution in titrating}}$$

Example:

Assume:
Neut. value of oil standard = 0.5 mg
KOH solution used = 12.5 ml

$$\text{KOH Factor} = \frac{0.5 \times 10}{12.5} = 0.4 \text{ mg}$$

Determination of Neutralization Value of Unknown . . . Repeat the above procedure except add 10 ml of the oil under test to 100 ml of the alcohol-water solution in the Cassia flask. If the color of the unknown oil is greater than 5, use 5 ml of the sample instead of 10 ml.

Pour the oil-water mixture into the beaker and titrate as above bringing the alcohol-water layer to the same shade of pink color as in the previous titration.

Neut. value of oil under test =

$$\frac{\text{ml of KOH solution used} \times \text{KOH factor}}{\text{ml of unknown oil used}}$$

Example:

Assume: 10 ml of unknown oil used
5 ml of KOH solution used

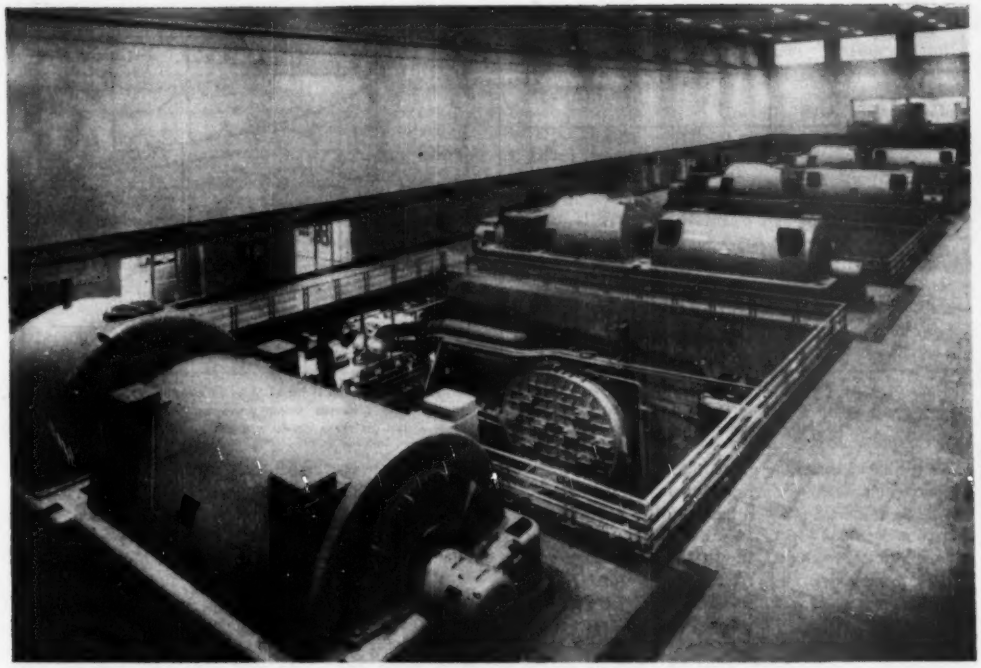
$$\text{Neut. value} = \frac{5 \times 0.4}{10}$$

$$= 0.2 \text{ mg KOH per gram oil}$$

In the testing of oils having color numbers higher than 5, the stirring time before titration should be 3 instead of 2 minutes.

Determination of Color . . . Distilled water is placed in the left tube of the colorimeter and the oil to be tested in the right tube. The colorimeter is held to the light and the disc rotated until the colors of the two tubes most nearly match. The discs are provided, one having a Union color range of 1 to 4 and the other 4 to 8. If the sample is out of range of one disc, the other disc is used. Colors between two Union color numbers are indicated either by plus or minus signs, or by simple fractions. Colors darker than 8 are called 8+.

Test Accuracy . . . Although it is not the intent to attempt to imply that the test kit acidity method is generally acceptable for the determination of neutralization value of insulating oils, the accompanying curves show about 100 values as determined by the field operators in comparison with the values determined at the laboratory on the same samples. The dash lines on each side of the "100% agreement" full line indicate the precision specified by ASTM for the presently effective standard for Neutralization Value (Acid and Base Numbers) by Color Indicator Titration, D974-48T. It will be noted that most of the points fall within these limits. Where they fall outside, the actual neutralization values usually are above 1.0 mg of KOH per gram, a range in which accurate determinations are not particularly significant from a screen testing standpoint.



MODERN HYDROGEN-COOLED UNITS rated 60,000 kw, 3,600 rpm on system of Dayton Power & Light Company

Today's Trends in Steam Plant Design

Initial article of a three-part resume of the status of station design. Authors discuss cycles, turbine generators and their application. Relate trends in pressure, temperature, unit size to station cost and efficiency

J. B. McCLURE and A. G. MELLOR,
General Electric Co, Schenectady, N. Y.

In today's expansion of utility systems steam stations have assumed an increasingly important position. Rising construction and fuel costs have emphasized the necessity of building the most efficient stations possible while at the same time keeping construction and operating costs to a minimum.

Improved Efficiencies . . . The major factors in improving station efficiency have been the continuing increase in steam temperatures and pressures and the development of the reheat cycle.

Station costs have been reduced by a combination of many design features, among the most outstanding of which are these:

1. Use of larger boiler-turbine-generator units and the use of only one boiler per turbine.

2. Use of the unit system with elimination of all steam and electrical interconnection between units.

3. Simplification of the auxiliary power system.

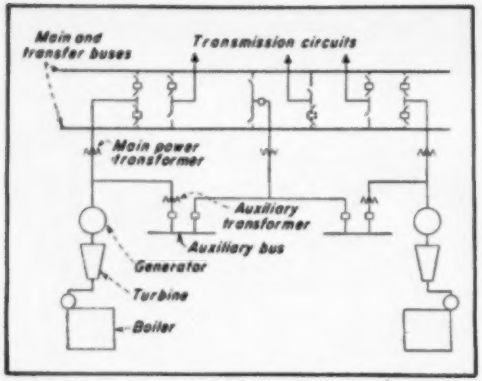
4. Reduction in the size of station buildings by putting a large part of the equipment outdoors.

5. Use of standard, factory-assembled equipment wherever possible.

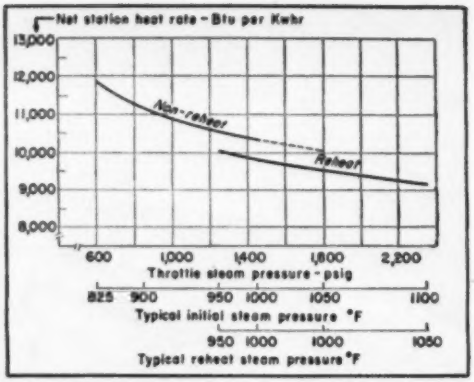
The major factor in reducing operating costs has been the reduction in operating personnel brought about by the development of automatic control devices and the use of centralized control rooms. The trend to larger turbines with only one boiler per turbine is another factor in the reduction of operating labor costs.

Station Arrangement . . . High reliability of modern boilers, turbine-generators, and transformers has made it feasible to eliminate all steam and electrical interconnections between units in the station. As most large generating stations feed power into a high-voltage system, the unit system eliminates the necessity for switching at generator voltage. This is an important consideration as the output of very large generating units may exceed the current rating of available switchgear at generator voltage. In addition, if several units are bussed at generator voltage, the interrupting rating of the switchgear becomes a problem.

Maximum steam temperatures and pressures have been continuously increasing as new materials and manufacturing methods have been developed. The maximum in use at present is 1,050 F at 2,000 psig, but stations are now being built for 1,100 F at 2,350 psig.



APPLICATION OF UNIT SYSTEM to large stations that feed into a high voltage system eliminates steam interconnections and need for high-rated switchgear at generator voltage



REPRESENTATIVE NET HEAT RATES obtainable in modern steam stations using different steam pressures, with and without reheat. Values shown on these curves are conservative

As available materials put a limit on maximum steam temperature that can be used, the reheat cycle has been revived and refined to increase further station efficiency. Reheating to the initial steam temperature results in an efficiency gain of about 5% which is approximately that which would be obtained by increasing the initial temperature of a non-reheat cycle by 175 F.

Typical and relative net heat rates that can be obtained in modern stations are shown in an accompanying graph. Values shown are conservative, and most stations operating at corresponding steam conditions have realized slightly better heat rates.

Steam Generators . . . Increases in steam generator sizes have kept pace with increases in turbine-generator sizes so that steam generators are now available capable of supplying all the steam required by the largest turbine-generator sets being built or proposed. The availability of these large steam generators has practically eliminated multiple units per turbine and has resulted in savings in steam and feedwater piping.

Developments in steam generator design, improved methods of firing, the use of automatic combustion control, and the use of economizers and air heaters have all contributed to gains in steam generator efficiency. Pulverized coal fired steam generators are now being built with an efficiency approaching 91%.

The trend to higher steam temperatures has made close control of primary and reheat steam temperatures essential. Differential firing or tilting burners together with attemperators have made it possible to obtain full steam temperature or gas recirculation within close limits down to about 60% load on the steam generator.

Larger steam generators naturally result in using divided auxiliaries which offer the opportunity of improving reliability of the station by using two or more auxiliary power busses. With such an arrangement somewhat more than half load can be carried on a unit after the loss of one auxiliary.

Turbine Developments . . . Developments in turbine-generator sets have been larger units and the increased use of 3,600-rpm units. As the size of power systems has increased, it has become feasible to install very large units to take advantage of their lower unit and operating costs.

Tandem compound, 3,600-rpm, double-flow units can be built up to at least 150,000-kw capacity and triple flow units up to at least 250,000 kw. At 1,800 rpm, tandem compound double flow units have been built up to 180,000 kw, and very much larger units could be built if required. By some modification in design and by providing more exhaust annulus area it appears possible to build single units at 3,600 rpm of considerably more than 250,000 kw. However in these very large capacities, a cross compound consisting of a 3,600-rpm, high pressure unit and an 1,800 rpm low pressure unit may be advantageously considered as a more conservative design.

The use of 3,600-rpm turbines has developed for several reasons. It is much easier to build reliable turbines for high pressures and temperatures if the dimensions of shells and rotors are kept as small as possible. This can be done in the higher speed machines. Smaller dimensions of 3,600-rpm turbines result in a saving in manufacturing cost over comparable rating 1,800-rpm turbines.

In most sizes 3,600-rpm are more expensive to build than 1,800-rpm generators, but this is more than offset by the saving on the turbine. In general, where the volume flow of steam is low as in the high pressure end of a turbine, 3,600 are more efficient than 1,800-rpm units. Where the volume flow is large, this situation may be reversed; and for this reason 1,800-rpm units are often used for the low pressure element of large cross compound units.

Reheat Turbines . . . Turbines used in the resuperheating cycle have been of two general types. In several installations cross compound sets have been used. The high pressure element has usually been a single casing, 3,600-rpm unit exhausting to the reheater at a pressure of about 400 psig. The low pressure element has been a tandem compound double flow condensing turbine.

In many other installations tandem compound, 3,600-rpm, reheat units have been used. In these units high pressure, high temperature steam is admitted at a mid-section of the turbine and flows forward through the high pressure turbine. After passing through the reheater, steam is readmitted to the turbine at a point adjacent to that at which steam was

initially admitted. From this point it flows back to the exhaust end of the turbine which may be double or triple flow depending on the size of the unit. In this type of turbine all parts subject to high temperature steam are located in a small zone at a mid-point in the turbine.

Generators . . . In the past it has usually been possible to build single generators for use with the maximum possible capability available from the turbine. Recent advances in turbine design, utilizing triple or quadruple flow tandem compound units have been matched by advances in the design of large 3,600-rpm generators such as new methods of cooling and new winding arrangements.

There has been a phenomenal increase in the size of these 3,600-rpm generators with increases in the kva capability at 30 psi hydrogen pressure of machines in service from about 139,000 kva in 1950, to about 162,000 in 1951, and to 184,000 on one group of machines and 220,000 on another group scheduled for 1952. While further developments under way can be expected to make it possible to design considerably larger 3,600-rpm generators, it is not possible to predict the ultimate economic size until a more critical and comprehensive review has been made by the industry of the relative cost of large single shaft and cross compound installations.

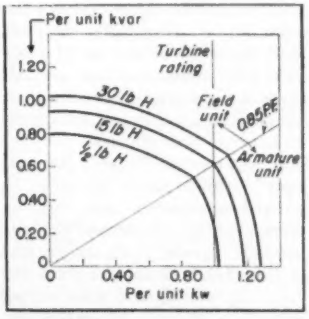
Capability Ratings . . . Generator rating should be such that a reasonable amount of reactive kva can be supplied when the turbine is operating at its maximum capability. In the past some confusion has existed as a result of assigning a turbine rating with some specified overload capability.

There is now a definite trend toward rating a turbine at its maximum guaranteed capability. A generator capable of delivering the turbine output at 0.85 power factor will satisfy most system conditions. Thus, if a generator rating at 15 psi hydrogen pressure is equal to the maximum turbine rating in kilowatts at 0.85 power factor, increasing the hydrogen pressure to 30 lb will enable it to deliver comparable reactive kva to match any extra capability in the turbine. A generator rated on this basis is only slightly larger with respect to the turbine than a generator with a kva rating at ½ lb hydrogen pressure equal to maximum turbine rating in kilowatts, which has been a common relationship between turbine and generator on a large percentage of units now in operation on power systems in this country.

A typical capability curve for a generator rated on this basis is shown. At power factors below 0.85 lagging, generator capability is limited by field heating while at power factors above 0.85 the limitation is armature heating. Generator capability at high hydrogen pressures should be based on winding copper temperatures not exceeding those existing at the base rating (now usually at 0.5 psi). It should be noted that the copper temperature is appreciably higher than the temperature indicated by the embedded resistance temperature detectors (RTD's) and that this difference increases with the higher loads possible with higher hydrogen pressure. Therefore the temperature rise shown by the RTD's will be lower for the increased loads carried at increased gas pressures for the same copper temperatures that are obtained at base rating.

Rising Voltages . . . For many years, 13.8 kv has been a generally accepted voltage standard for large generators because this system voltage has become standard. As generator size increases it becomes increasingly difficult to design and build generators at this voltage. Since very few of these large machines supply loads directly at generator voltage, the choice of voltage is not usually dictated by system conditions. There is therefore no reason why these large generators should be built at 13.8 kv or at any other standard voltage.

Choice of voltage should be left to the designer who can then select the value that will result in the best and most economical design of generator and associated equipment. Present design practice indicates that up to about 115,000 kva, 13.8 kv is a satisfactory voltage. Above this size the question of optimum generator voltage becomes more intimately associated with the problem of balanced generator design which further emphasizes the desirability of a reasonably free choice of voltage. In any event it appears that this voltage will fall for most cases within the range of 13.8 kv to 22 kv for some time to come.



CAPABILITY CURVE for hydrogen-cooled generator rated at 15 psi hydrogen pressure to equal maximum turbine rating in kilowatts at 0.85 power factor

Until the Preferred Standards for Turbine Generators were established, most large generators were built with a short circuit ratio of 0.90 or higher. These high values of short circuit ratio were specified in an attempt to improve system stability. The Preferred Standards specify a short circuit ratio of 0.80, but well-designed systems using automatic voltage regulators should not have a stability problem using generators having short circuit ratios considerably below this value. Reduction in the short circuit ratio permits more generator-kva for a given frame size. Advantage can be taken of this to reduce the size and cost of present generator ratings or alternately to design larger ratings of generators than now considered feasible.*

Before the general adoption of the unit system there was some demand for large double winding generators, principally because of the limitations of available switchgear at generator voltage both in interrupting capacity and current carrying ability. As used here, the term "double winding" refers to a generator having two separate current carrying paths brought out for external connection and designed for unequal loading. In contrast to this many large modern generators also have multiple bushing, but the external connections between the machine and the system should be so arranged that the parallel paths in the machine are equally loaded.

In larger machines the use of multiple bushings will probably become quite common, but with the almost universal use of the unit system there will be practically no demand for double winding generators.

* See article by S. B. Crary and J. B. McClure "Low Short Circuit Ratio for Turbine Generators Is Practical"—Electrical World, June 30, 1952

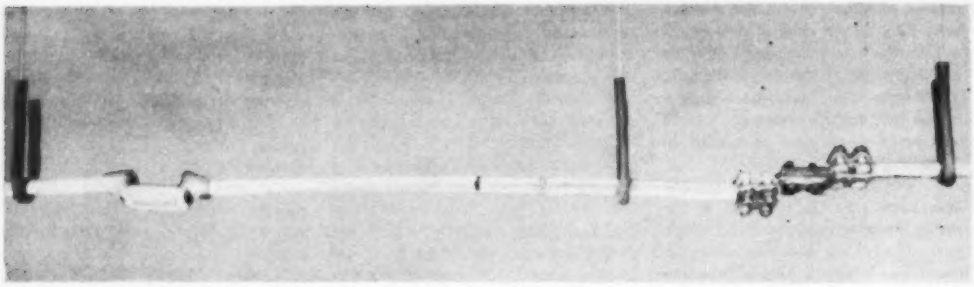


FIG 1—BOLTED TYPE terminals and "equalizers" in typical portion of test assembly subjected to hundreds of heat cycles

What Temper Is Best For Insulated Aluminum Conductors?

Heat cycle tests at the Electrical Conductor Laboratory of the Aluminum Co of America show advantages of intermediate temper for best overall "connectibility" characteristics for insulated aluminum wire and cable

JOEL TOMPKINS, Chief, Electrical Engineering Division, Aluminum Research Laboratories, Aluminum Co of America, Massena, N. Y.

There has been a wide background of experience with the successful performance of terminals, connectors, and similar fittings on overhead ACSR and aluminum conductors. This background did not exist several years ago for fittings used on insulated aluminum conductors.

Selection of fittings for insulated aluminum conductors involves somewhat different considerations than their selection for overhead conductors. Differences are due largely to limitations of space normally available for fittings on insulated conductors, the necessity of taping some fittings, and similar factors.

To determine the types of commercially available fittings satisfactory for use on insulated aluminum conductors and the features of design and application vital to good performance, the testing of terminals, connectors, and fittings has been in progress for several years at the Electrical Conductor Laboratory of the Aluminum Co of America at Massena, N. Y.

Much of the testing has been done by "heat cycling" series assemblies of test fittings installed on cable. In such cycling, the assemblies have been alternately heated by the passage of rated current and then allowed to cool with no current, on a fixed time cycle. Such testing has been found to be quite severe, especially if differences of thermal co-efficients of expansion are involved.

Test Results—For Normal Service . . . The intermediate temper appears to be desirable for best overall "connectibility" characteristics for insulated aluminum wire and cable, for normal service with current loadings allowed for insulations such as Type RH. The tests reported below showed excellent results with both bolted-type and compression terminals on cable of intermediate temper, even without joint compound and with one crimp only on the compression terminals. With the recommended use of a suitable joint compound and with the recommended numbers of crimps on the compression terminals, even better results have been obtained.

It appears that, for best "connectibility" charactertistics in bolted or screwed terminations and taps, for normal service with current and temperatures allowed for insulations such as Type RH, insulated aluminum wire and cable should have some temper softer than full hard. For use in compression fittings in normal service an intermediate temper and the full hard temper show about the same results.

Tests have also been made at the same laboratory of connections of "eyelets" of No. 12 solid aluminum wire under heads of screws in terminal blocks. Here, again, it was found that wires of intermediate temper showed quite satisfactory results and somewhat better "connectibility" than wires of full hard temper.

Joint Compound . . . From the results of other tests at the same laboratory, it is known that the use of a suitable joint compound on the outside of the wire or cable, and between the strands of a stranded cable, within the contact region, would have appreciably reduced the levels of resistance ratios and temperature rises obtained in the tests described below.

The use of such a joint compound would have also reduced the effects of "cycling" and would have minimized effects of differences of temper. These statements apply particularly to bolted and screwed terminations and taps and, to a lesser extent, to compression types of fittings. In addition, a suitable joint compound is desirable to minimize the possibility of corrosion difficulties in some types of exposure.

Aluminum Fittings Best . . . Other tests at the same laboratory have shown that, in general, better results have been obtained on aluminum wire and cable with terminals and taps of aluminum, rather than of any other metal. With aluminum fittings, there can be no difficulty caused by differences of temperature co-efficients of expansion.

The possibility of trouble by corrosion between fittings and conductors under severe exposure conditions can also be minimized by the use of aluminum fittings on aluminum conductors.

The tests reported below, with bolted-type, tin-plated copper fittings have indicated that the effects of differences of co-efficients of expansion are reduced if the strands of the cable have some temper softer than full hard. It has also been shown in other tests that the provision of adequate "elasticity" in a fitting, if of a metal other than aluminum, can reduce the effects of differences of co-efficients of expansion.

Handling Characteristics . . . It has also been found that an intermediate temper is more desirable than the full hard temper for insulated aluminum conductors for improved "handling" characteristics, reduced "springiness," and, for small sizes of wire, increased resistance to failure at bends. It has been found that the intermediate temper provided adequate tensile properties for practically all applications. The use of an intermediate temper in insulated aluminum conductors has been approved by Underwriters Laboratories and has been made mandatory for branch circuit sizes.

Early in the work of heat cycling fittings on insulated aluminum cables at Alcoa's electrical conductor laboratory, it was recognized that similar fittings installed in the same way on cable of the same size from different manufacturers showed different results. It appeared that the temper of strands could be one factor affecting the "connectibility" of the cables. To determine the effects of changes in temper, the tests described below were made. The results of these tests showed that changes of temper may have significant effects.

Two series of tests were made, one with bolted-type and the other with compression terminals. One series was made using a number of similar bolted-type terminals with tin-plated copper alloy bodies and each with four ½-in., silicon-bronze clamping bolts. A copper alloy terminal was selected as it was known that such a fitting would tend to emphasize any differences in performance caused by differences of cable strand temper and because there has been interest in the possible interchangeable use of such fittings on aluminum and copper cable. The type chosen for test was substantially designed, had reasonably long contact surfaces, adequate clamping force, and properly fitted the cable.

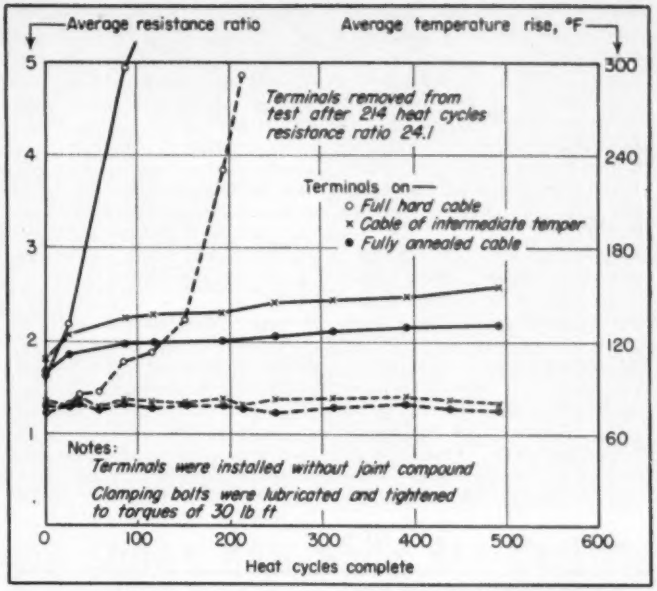

Average resistance ratio
Average temperature rise, °F
Terminals removed from test after 214 heat cycles resistance ratio 24.1
Terminals on—
o Full hard cable
× Cable of intermediate temper
• Fully annealed cable
Notes:
Terminals were installed without joint compound
Clamping bolts were lubricated and tightened to torques of 30 lb ft
Heat cycles complete

FIG 2—AVERAGE RESISTANCE AND TEMPERATURE RATIOS for the bolted-type, tin-plated copper alloy terminals on 1,000,000 cir mil aluminum cables of three tempers

Various Tempers . . . Lengths of 1,000,000 cir mil, 61-strand, bare-aluminum cable were obtained in various tempers, including full hard, intermediate temper, and fully annealed. As far as possible, all characteristics of the cables were identical except for the temper. The tensile properties of the strands of the three types of cable are shown in the upper portion of table below.

The test cables were cut into sections about 41-in. long and pairs of sections were joined by welded type "equalizers," which were used to solidly tie together all 61 strands of the cable sections, midway between test terminals, and to provide points for voltage connections for resistance measurements. To minimize differences in clamping forces developed by the terminals, the locking-type washers supplied on the clamping bolts were replaced with flat silicon-bronze washers, and the bolt threads were lubricated with heavy colloidal graphite grease.

Either two or four terminals were installed on cable of each temper. All clamping bolts were tightened with a

Properties of Strands of Test Cables

	Temper	Diameter In.	Tensile Strength PSI	Elongation Percent In 10 In.
Bolted Type Terminals	Hard Drawn	0.1274	31,500	1.6
	Intermediate	0.1274	18,600	8.1
	Fully Annealed	0.1274	13,100	22.4
Compression Type Terminals	Hard Drawn	0.1280	27,300	1.8
	Intermediate	0.1280	19,500	7.9
	Fully Annealed	0.1280	13,300	24.7

torque wrench to 30 lb-ft. Since the use of a joint compound would have tended to reduce performance differences caused by the differences in temper, no joint compound was used. The spades of terminals on cables of the same temper were bolted together to form a series circuit. Fig 1 shows one pair of terminals and one "equalizer" in a typical portion of the test assembly.

Terminal Resistance . . . The resistance of each terminal and its cable section was measured before the start of cycling and at intervals during cycling. The maximum temperature rise of each fitting over room temperature was recorded for a number of cycles throughout the test, with the temperature of each terminal measured by means of a copper-constantan thermocouple imbedded in the barrel section of the terminal. Each cycle consisted of a heating period of four hours using a current of 785 amp, 60 cycles, followed by a period of three hours with no current. The current value used is the National Electrical Code rating in still air of 1,000,000 cir mil aluminum cable with Type RH insulation. The times selected were sufficient to allow the temperatures of terminals and cables to reach steady values during the alternate heating and cooling periods.

Resistance Measurements . . . were made of each terminal assembly between a punch mark on the terminal and one on the adjacent "equalizer" on the same cable. On the terminal, the punch mark was located on the lower surface of the spade, opposite the end of the barrel. On the "equalizer," the punch mark was located opposite the effective end of the cable. From the measured resistance of each terminal assembly was subtracted the nominal resistance of the cable between the terminal and the punch mark on the "equalizer." The remaining resistance was divided by the nominal resistance of a piece of cable, as long as the cable groove in the terminal barrel, to determine the "resistance ratio."

Resistance Ratios . . . Average resistance ratios and average temperature rises are shown in Fig 2 for the bolted-type terminals on the cables with strands of three tempers.

From Fig 2 it may be seen that the terminals on the full hard cables started the test with low risistance values and low temperature rises, but these values rapidly increased. The fittings were considered to have failed because of high temperature after 214 cycles. The terminals on the fully annealed cable showed much better performance, followed closely by the terminals on the cable of intermediate temper.

Other Tests . . . Fig 3 show the results of the other series of similar heat cycle tests, of commercially available aluminum compression terminals on lengths of 1,000,000 cir mil aluminum cable of the three tempers, full hard, intermediate temper, and fully annealed. The average tensile properties of strands of the cables used in this series of tests were similar to those mentioned above and are shown in the lower half of table.

In these tests also, to avoid minimizing possible differences resulting from differences of temper, no joint compound was used, and only one circumferential crimp was used on each terminal though the manufacturer recommends two crimps. Each curve shows the average for two terminals. These curves show that the best results were obtained with terminals on cable of intermediate temper, though the performance on full hard cable appeared to be almost as good. In another similar series of tests, the performance of compression fittings on full hard cable appeared slightly better than on cable of intermediate temper, so that in compression fittings, there may not be any significant difference in performance of cable of full hard temper and of the intermediate temper tested.

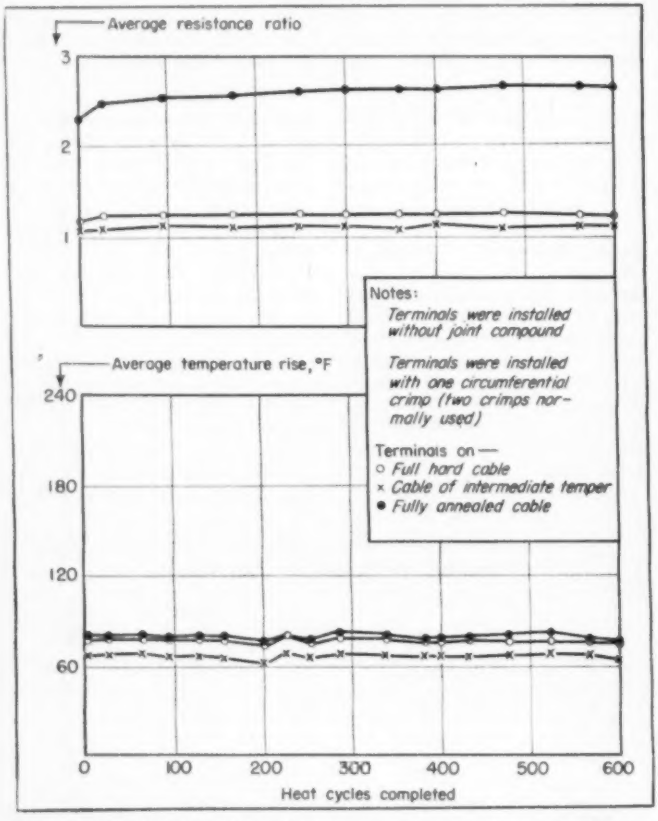
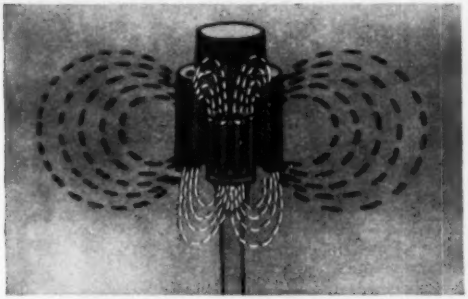


FIG 3—AVERAGE RESISTANCE RATIOS and average temperature rises for aluminum compression terminals on 1,000,000 cir mil aluminum cables of three tempers

QUALITY-CONTROL STAND REGULARLY TESTS SAMPLE METERS—CHECKING ACCURACY OF BOTH OPERATORS AND PRODUCTION TEST PANELS

New G-E Meter Movie Shows How I-50's Are Certified



ANIMATED SEQUENCE, one of several, shows how disk is magnetically suspended. Side thrust against guide bushings is 2000 times less than total bearing pressure of conventional meters.

"Accent on Accuracy"—new sound, color film shows development, construction of I-50 meters

General Electric's new full-color motion picture—"Accent on Accuracy"—is now available for showings by utilities. It describes the radical design developments, manufacturing techniques, and quality control procedures that have made possible factory-certification of I-50 meters.

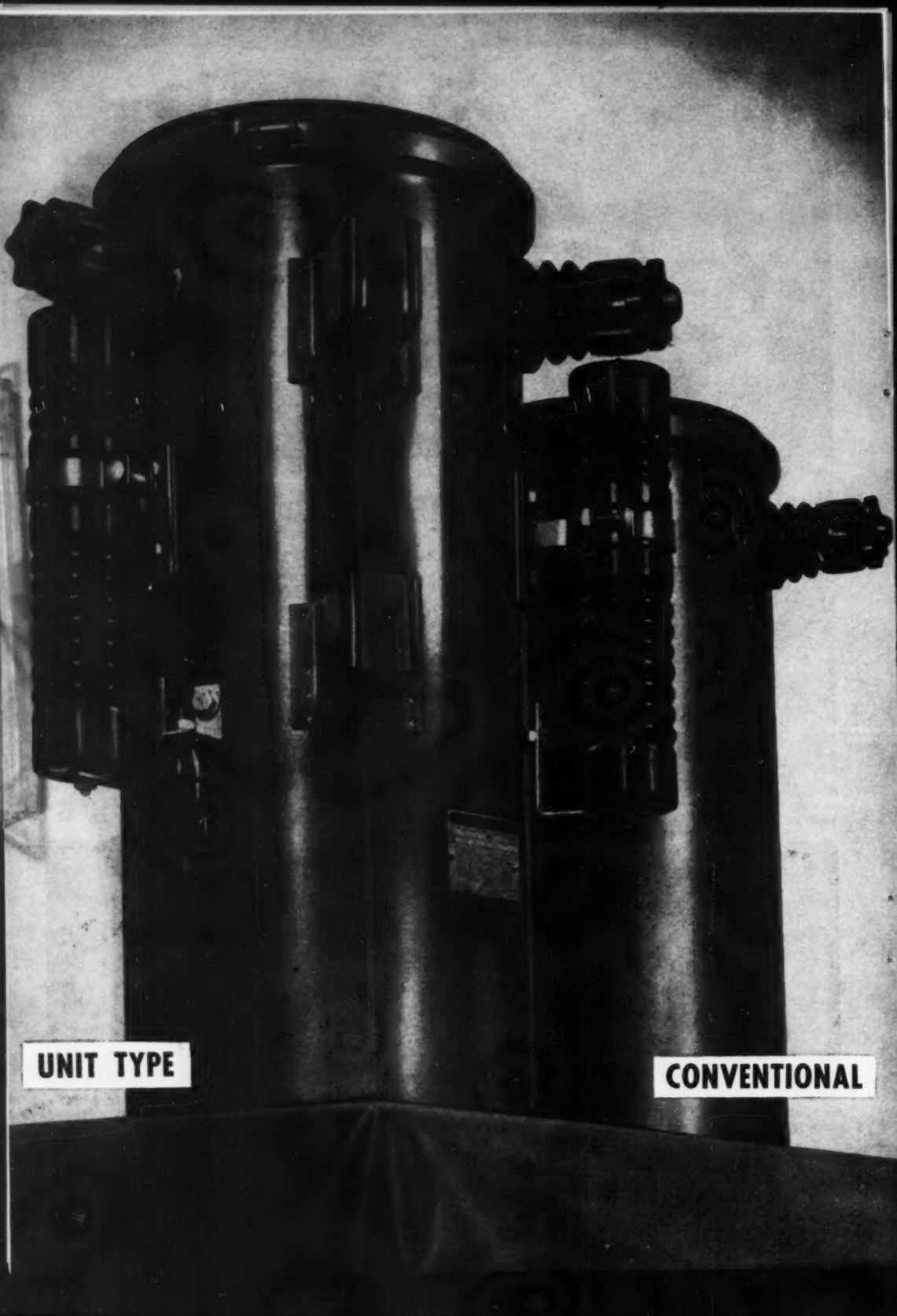
Animated sequences are included. These show the importance of meters, operation and development of the watthour meter, and how the I-50 floating disk works.

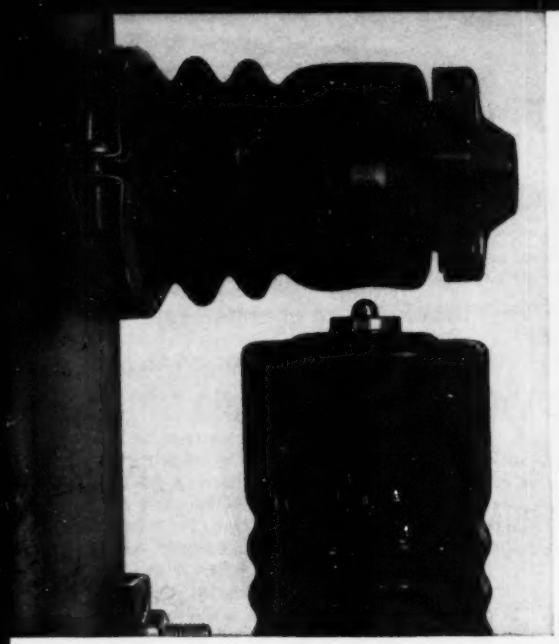
"Accent on Accuracy" is offered to any utility—both for employee information and to show customers the story behind services. If you would like to see or use this 16-mm film, call your local G-E representative or write Section: 601-83, General Electric Company, Schenectady, N. Y.

INSPECTIONS FOR CLEANLINESS are important because lint and other particles cause most performance rejects. Film shows many precautions which are taken during manufacturing.

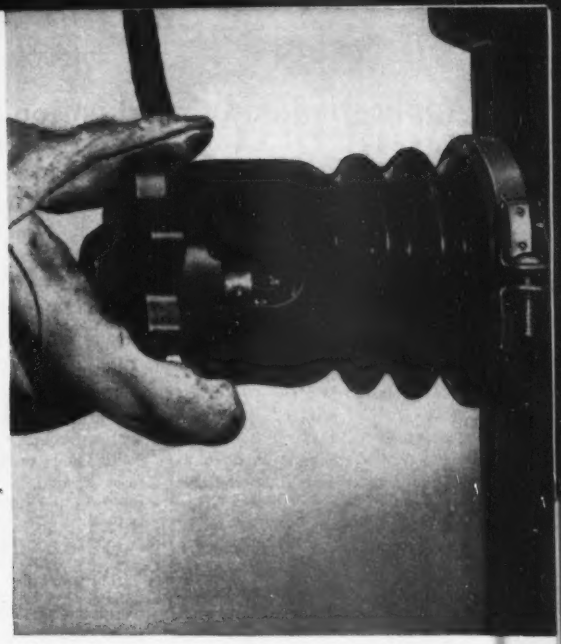
PERMANENT LAG ADJUSTMENT is made on stator. As film shows, operator tests, then equipment automatically punches holes for permanent calibration. Process eliminates need for further adjustment.

GENERAL ELECTRIC


UNIT TYPE
CONVENTIONAL



NEW PELLET ARRESTER on General Electric unit-type transformer is isolated from the high-voltage lead by an external gap. The gap keeps the arrester at ground potential and prevents line grounding in case of arrester damage.



NEW TANK-WALL BUSHING on both conventional and unit-type G-E transformers allows safer, faster connections from either side of the bushing—without tools. A twist of the wrist is all that's needed to clamp cable securely.

Why new G-E transformers are easier to connect, better protected

General Electric Spirakore* transformers are now easier to install. Both the conventional and the unit-type have new tank-wall high-voltage bushings which eliminate exposed live parts—permit safer, faster connections without tools. Cable can be brought in from either side of the new bushings; its insulated cap cannot drop off when unscrewed.

EXTERNAL GAP PROTECTS UNIT-TYPE

The compact design of the new unit-type G-E transformer includes a breaker, a high-voltage fuse, and a new gapped Pellet arrester. The external gap isolates the Pellet arrester from the high-voltage lead. Elimination of the positive electrical connection keeps the arrester at ground potential and prevents line grounding in the case of arrester damage.

PROTECTION THAT LASTS

Because the Pellet arrester is a valve-type arrester that has unlimited interrupting capacity, you can apply G-E unit-type transformers anywhere on your system without regard to system short-circuit current. And because a valve-type arrester is not eroded by discharge, the Pellet arrester offers protection that lasts indefinitely.

THE BEST PACKAGE YOU CAN BUY

Nitrile gaskets at every opening keep G-E Spirakore transformers moisture-proof. A one-piece cover band produces uniform gasket pressure around the entire rim, facilitating inspection and maintenance. Two baked-on paint coats provide superior resistance to weathering, water absorption, and abrasion. These features plus Spirakore design with its lower losses, greater short-circuit strength, and superior regulation, make a G-E transformer the best package you can buy.

These new G-E Spirakore transformers, both conventional and unit-type, are available in ratings 5 kv and below, 100 kva and below. For more information see your nearest Apparatus sales office, or write to Section 402-128, General Electric Co., Schenectady 5, N. Y.

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GENERAL ELECTRIC

Application and Coordination of Distribution System

Sectionalizing Devices

Second of a series of two articles by this author explaining and clarifying the techniques of sectionalizer coordination. The first appeared in the Aug. 25 issue, pages 98-101

H. B. THACKER, Distribution Engineer, Electric Utility Engineering Dept, Westinghouse Electric Corp, East Pittsburgh, Pa.

Part I of this series of two articles on this subject included the various applications of these devices. Also included was the first of three examples of coordination between common line sectionalizing devices. Three hypothetical feeders (A, B, and C) were assumed, and for purposes of comparison they were considered identical in length, conductor size loading, and location of taps. Feeder A, which makes use of fuses throughout for sectionalizing, was covered in Part I. This article will cover the remaining two feeders B and C.

Feeder B . . . This feeder has a line recloser and a substation recloser. In Feeder B a single-phase, 50-amp recloser is used at location B3. Fig 2 shows the coordination obtained for devices in this example. As it was desirable to have the recloser at B3 reach out to the end of feeder branches B9 and B10 and to furnish overlapping protection to the fuses at B5, B6, B7 and B8, it was necessary to use 15-amp fuse links at B7 and B8 instead of the 10-amp links of Feeder A described in the previous article in this series.

The 50-amp recloser, B3, set for two instantaneous and two time delay operations, furnishes complete overlapping protection to all line fuses beyond it. This is evident in Fig 2, as the entire operating portion of the fuse curves lies within the range of operation of this single-phase, 50-amp recloser.

Needless Operations . . . In order to avoid needless operations of the substation recloser B1 for faults beyond B3, its operation is set for all time delay. With this arrangement the substation recloser will not respond to any faults which recloser B3 or its associated fuses should interrupt. In doing this, however, it is no longer possible for the substation recloser to protect the fuse at B4 from outages due to temporary faults. All faults on the B4 branch then, regardless of their nature, will result in a prolonged service outage on the branch. If it is desirable to improve service continuity on branch B4, a 15-amp recloser can be used in place of the fuse. In order to avoid needless recloser operations except for transformer winding or secondary faults, the recloser B4 would be set for all time delay operations, as was the case with B3.

Comparing the performance of Feeder B with Feeder A (see Part I) the addition of reclosers at B3 and B4 and their proper coordination with the remaining fuses and substation recloser provide considerably better service continuity to all services beyond locations 3 and 4. Complete overlapping protection and the opportunity for clearing or isolating the great majority of faults without a prolonged service interruption are responsible for a great reduction in customer outage hours with the arrangement of Feeder B that is shown in Fig 1.

Feeder C . . . This feeder, shown in Fig 1, uses fuse, sectionalizers, liner and substation reclosers. Automatic sectionalizers are operated in conjunction with a recloser in place of the fuses of Feeders A and B. The pur-

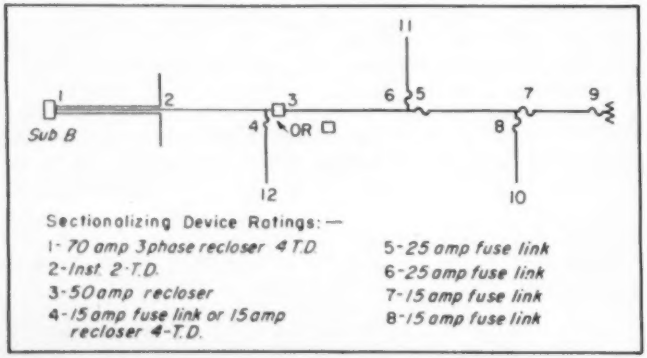

FIG 1—FEEDER B has fuses along with line and substation reclosers. Entire portion of fuse curves lies within range of operation of recloser

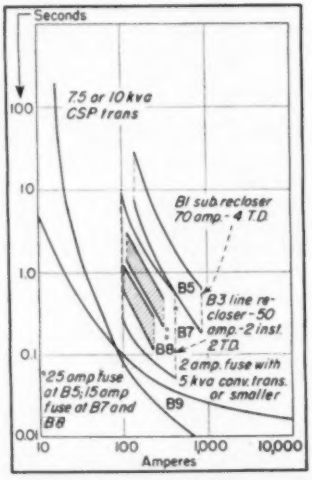

FIG 2—FEEDER B sectionalizing device ratings show coordination obtained

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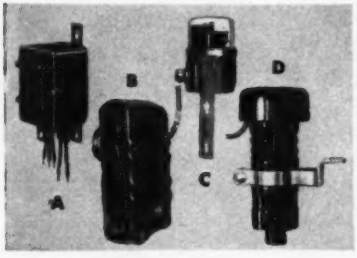
Illustrated is the Type RO, normal power factor outdoor automatic current-regulating transformer; ratings 5 to 30 kw. Other G-E constant-current transformers: ROC, outdoor, high pf, 5 to 30 kw; RF, station-type, air-cooled, normal pf, 15 to 50 kw.

G-E TYPE RO TRANSFORMER



- ***Protect your circuits***
- ***Reduce operating costs . . .***

WITH G-E CONSTANT CURRENT CONTROL DEVICES

A Type J-1 Protector—provides protection from the hazards of open circuit conditions.

B Fuse Cutout—for primary fault and surge protection.

C Type P-1 Photoelectric Relay—low cost control automatically turns lighting circuits on at dusk, off at dawn.

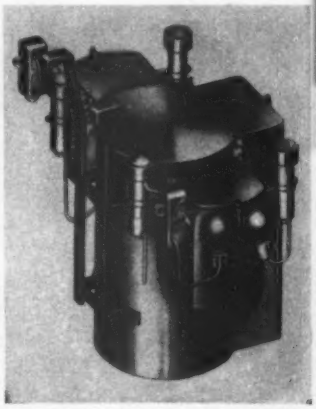
D Pellet Lightning Arrester—for protecting both primary and secondary side of transformers.

E Type E-1 Controller (not shown)—heavy-duty solenoid-operated oil switch to control transformers.

- ***Cut installation time and expense . . .***

WITH G-E "PACKAGED" REGULATORS

You reduce installation time and conserve pole space with G-E "packaged" Substation Type Constant-Current Regulators (illustrated at right). Available in 15, 20, 25, and 30 kw ratings, these "packages" contain all protective and controlling elements for efficient, economical series street-lighting operation where 120 V, 60 cycle control power is available. They are factory assembled and can be put into service simply by connecting power and control leads. Each component is readily accessible for servicing.



G-E SUBSTATION-TYPE REGULATOR

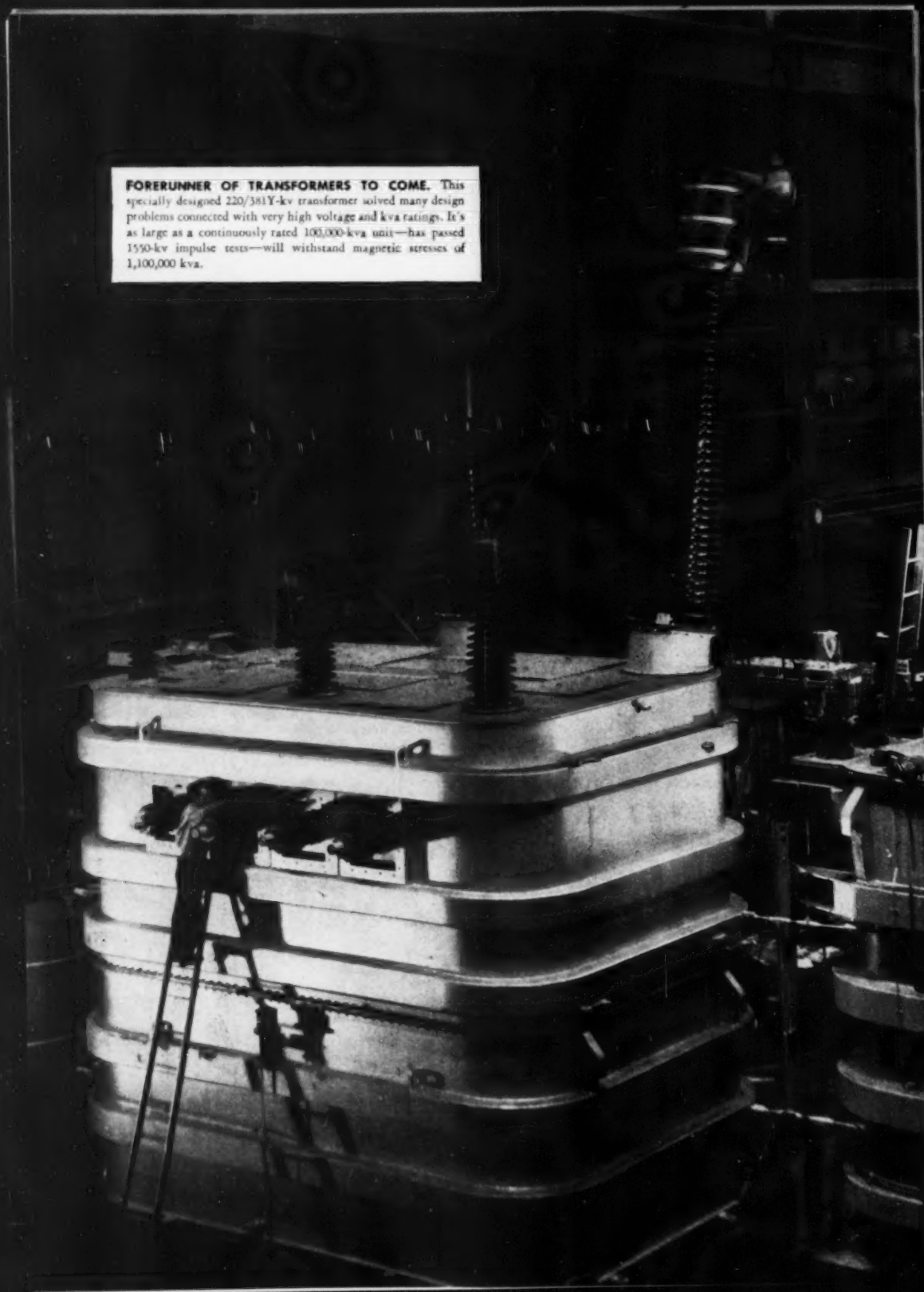
- ***Reduce planning, purchasing costs . . .***

WITH G.E.'s COMPLETE LINE OF EQUIPMENT

You can get all the equipment and devices you need for your series street-lighting systems from G.E.

Moreover, G-E lighting engineers will be glad to help you plan for your street-lighting needs. For information on any of the above equipment, or on G-E engineering service, write *Section 452-131, General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC



FORERUNNER OF TRANSFORMERS TO COME. This specially designed 220/381Y-kv transformer solved many design problems connected with very high voltage and kva ratings. It's as large as a continuously rated 100,000-kva unit—has passed 1550-kv impulse tests—will withstand magnetic stresses of 1,100,000 kva.

"CONCENTRIC LAYER" transformers withstand short-circuit forces of 1,100,000-kva duty

Units, impulse-tested at 1550 kv full wave, are installed in General Electric's new Switchgear Development Laboratory at Philadelphia.

Transformers for repeated short-circuit duty. Two 220,000/381,000Y—7750/15,500-volt transformers, connected to special short-circuit generators, supply the power that permits the new Switchgear Laboratory to simulate actual system faults. Each transformer can deliver 1,100,000 kva for a period of 10 cycles . . . and repeat this performance 15 times an hour.

"Concentric layer" winding solves short-circuit problems. The extremely severe duty requirements of these transformers were readily satisfied by the "concentric layer" winding. In this design, the conductor is wound in successive layers arranged concentrically and connected in series.

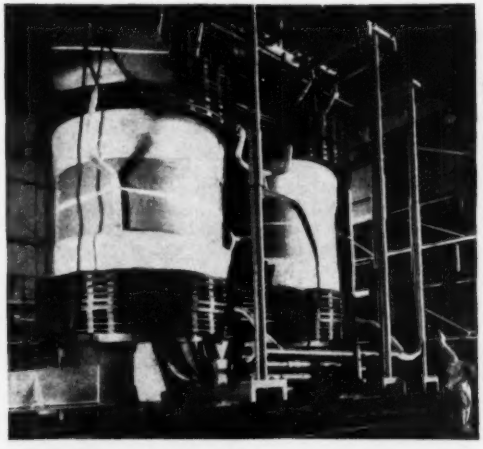
High short-circuit strength is inherent since major magnetic forces (as high as 2800 tons) are radial and well within both the tensile strength of the high-voltage conductors and the compressive strength of the cylinder on which the low-voltage coil is wound.

Impulse strength to withstand 1550-kv test was achieved readily with the "concentric layer" design. Voltage stress between layers is limited to the voltage of one layer since adjacent layers are connected in series.

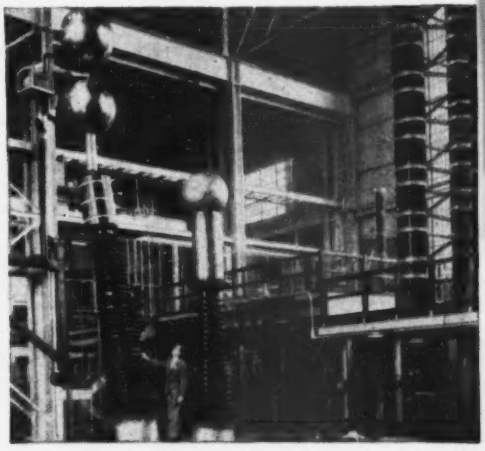
The cylinders of insulation between the layers are flanged over the ends of the winding to eliminate creepage in the direction of high electrical stress.

Uniform distribution of impulse voltages throughout the windings is assured by complete electrostatic shielding.

"Concentric layer" transformers for your system. These testing transformers, while designed to meet unusual requirements, demonstrate the excellence of "concentric layer" windings for high-kva, high-voltage service. If you are using or contemplating voltages 161 kv and above, you may wish more information on this design. Ask your local G-E apparatus sales representative for Bulletin GER-129, or write Section 401-31, *General Electric Co. Schenectady 5, New York.*



INHERENT SHORT-CIRCUIT STRENGTH of "concentric layer" design is even greater in these transformers because windings are tighter, more compact. Internal cooling ducts could be omitted since a continuous rating was not required for intermittent test operation.



282% OF RATED VOLTAGE. Test man sets 100 CM gaps for induced voltage test at 282% of rated voltage. Electrostatic shielding between all high-voltage-winding layers assures uniform impulse distribution in spite of the numerous tap leads brought outside the transformer.

GENERAL ELECTRIC

pose of the sectionalizers at locations 5, 6, 7 and 8 is the same as was the purpose of the fuses at the same locations in Feeder B shown in Fig 1.

It is desired that a sectionalizer only open to clear a permanent fault after the recloser has opened one or two times to allow the fault to clear if temporary. However, the use of sectionalizers largely eliminates the coordination problem since for currents above the minimum tripping current of recloser, the opening of any sectionalizer will depend directly on the number of times the recloser operates.

In Feeder C sectionalizers at C7 and C8 will only open for a fault on their respective branches after the recloser at C3 has opened for the second time. Since sectionalizer C5 also carries the fault current for a fault beyond C7 or C8, its coordination with C7 or C8 sectionalizer is obtained merely by setting it to open during the third opening of the C3 recloser. C6 sectionalizer not being in series with any others can be set for either two or three recloser operations, whichever is desired.

The curves of Fig. 4 show the coordination of devices in Feeder C. As in Feeder B, a 50-amp recloser at C3 gives coordination with the 2-amp fuse, which would ordinarily be applied to a 5-kva (or smaller) conventional transformer. The 50-amp recloser also coordinates with the protective links in the 7½ or 10-kva CSP type transformer.

Fault Currents . . . The range of fault current over which the C3 recloser must operate is taken from the calculated fault currents for Fig. 3 and is shown on the reclosure curve as from 103 to 425 amp. It is necessary that the recloser's protection extend to the end of the farthest section beyond the last sectionalizer being controlled by the recloser. In Feeder C this means that the recloser should be able to recognize a minimum fault at C9 or C10, otherwise no protection exists for such faults. The sectionalizer interrupts no fault (or even load) current. This is contrary to the case of fuses with incomplete overlapping protection from a recloser, such as in Feeder A.

The fuses, for currents out of the range of overlapping protection, make no distinction between temporary or permanent faults. They do, however, isolate a fault regardless of its nature, from the rest of the feeder. The sectionalizers, being directly dependent on an associated recloser, can only operate to isolate a fault if the recloser first recognizes the fault and then performs the required number of operations.

However, use of sectionalizers in place of fuses will make the choice of a recloser rating easier by eliminating the need for coordinating the wide band curves of several protected fuses within the operating range of the recloser.

The sectionalizer curves shown in Fig 4 are merely representative of the total time which fault current flows for two and three operations of the recloser. Since the sectionalizers inherently coordinate with the associated recloser, the C3 recloser could be set for any combination of instantaneous and time delay operations without having an effect on the sectionalizer coordination.

The two-instantaneous, two-time delay setting of C3 recloser is generally preferable since unnecessary operations are avoided and the duration of service interruption is less for many temporary faults.

As in Feeder B the 70-amp substation recloser is set for all time delayed operations in order to coordinate with devices at C3 and beyond. If improved service continuity is desired on the branch beyond C4, a 15-amp recloser would be used in place of the fuse at C4.

Objectives . . . The principal objectives of the application of sectionalizing devices in a system are:

1. Improvement in service continuity.

2. Decreased damage to line and substation equipment.

3. Minimize costly service calls.

The cost of apparatus to secure these objectives must be balanced against the potential gain in revenue and savings in operating cost for a particular system. However, the increasing size and importance of the suburban and the rural loads is resulting in ever greater justification for the installation of modern effective sectionalizing devices. The "mechanized protection" furnished by these devices is most effective when the devices are carefully applied and coordinated.

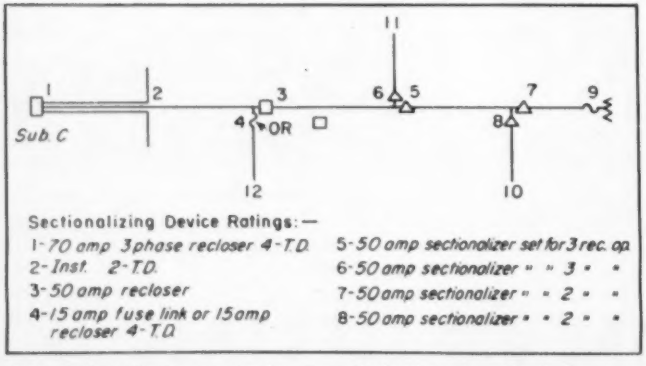


FIG 3—FEEDER C has fuses, sectionalizers line and substation reclosers. Sectionalizer curves are merely representative of time fault current flows for 2 and 3 recloser operations

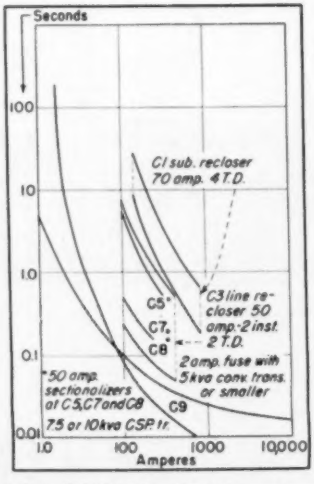
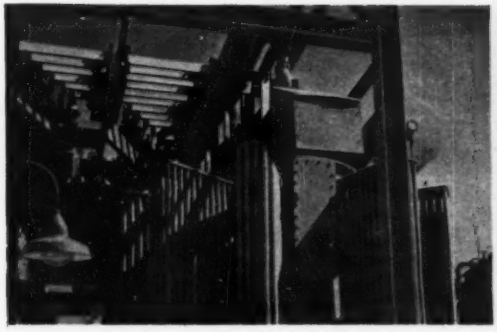
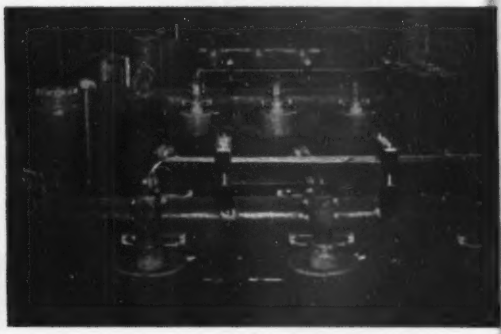


FIG 4—FEEDER C Coordination curves sectionalizer devices used

It takes a Lot of Copper to make a Lot of Chemicals!





These photographs show a lot of copper bus bar in a new plant of a great chemical company, whose name and location cannot be disclosed. The copper carries heavy currents to electro-chemical equipment for the production of valuable products used in national defense and in industry. Revere furnished 325,000 pounds of bus bar for this service, the bar going into substations, rectifier stations, and cell houses. In addition, at the time of installation the Revere Technical Advisory Service collaborated with the customer in working out some difficult details in the design of switches. If you need electrical conductors, remember that copper has the highest electrical conductivity of all the commercial metals, that Revere makes bus bar, and that the Revere Technical Advisory Service is always ready to work with you on any problem concerning copper and its alloys or aluminum alloys. Call the nearest Revere Sales Office.

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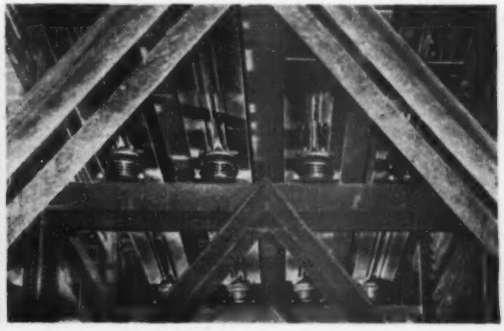


LOAD PICKUP SWITCH consists of standard sectionalizer with solenoid closing mechanism and special timing relay added

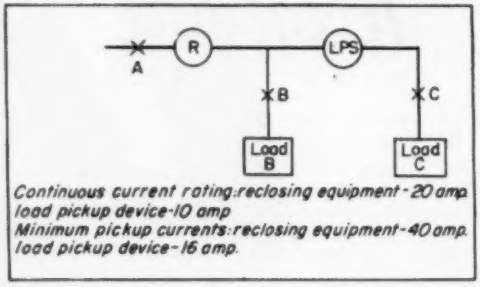


FIG 1—SYSTEM in which load pickup switch LPS will energize load C after load B if necessary. Diversity factor is 2.5

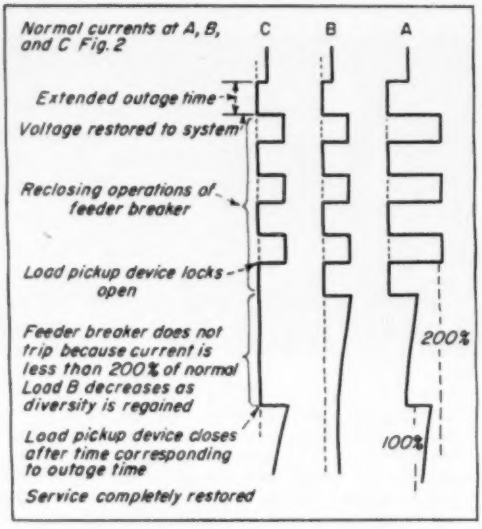

Normal currents at A, B, and C Fig. 2
C
B
A
Extended outage time
Voltage restored to system
Reclosing operations of feeder breaker
Load pickup device locks open
Feeder breaker does not trip because current is less than 200% of normal
Load B decreases as diversity is regained
Load pickup device closes after time corresponding to outage time
Service completely restored
200%
100%

FIG 2—BEHAVIOR OF SYSTEM (Fig 1) as would be shown by recording ammeters. Load pickup switch LPS set to open after three reclosing operations of breaker R. Time is not to scale

Modified Sectionalizer Cuts Load Pickup Time

A. W. EDWARDS and L. V. CHABALA, Switchgear Division, Engineering Dept, Westinghouse Electric Corp, East Pittsburgh, Pa.

The addition of automatic features to an existing standard sectionalizer will convert it to a load pickup switch which can eliminate most of the time consuming operations generally associated with recovering loads after extended outages. At the same time, it will give the same fault protection as a sectionalizer and keep the cost within practical limits, thus allowing application at many points on the system.

Modification of the sectionalizer to make it a load pickup switch consists of adding a solenoid closing mechanism and special timing relay. All sectionalizer features are retained so the device may be used for sectionalizing in the normal manner. Closing mechanism is mounted inside sectionalizer tank and timing relay is mounted in weathertight box attached to the cover casting.

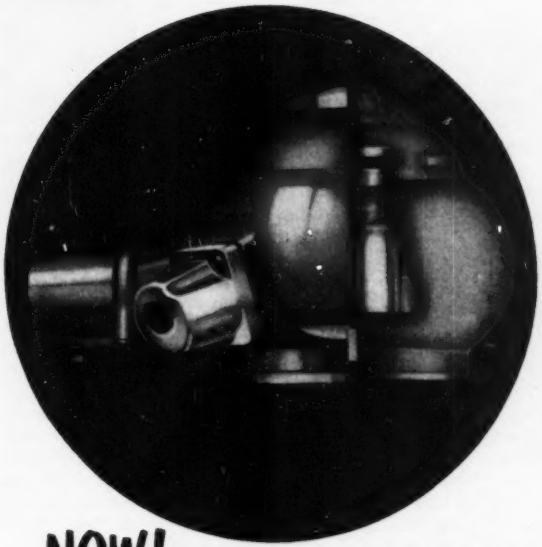
A solenoid mechanism on the load pickup switch is arranged to close main contacts of the switch when control voltage is applied.

The timing relay is equipped with normally open contacts which are closed a predetermined time after voltage is applied to the relay. This action energizes the solenoid mechanism and closes main switch contacts if they are open. Time delay between initial application of voltage to the relay and closing of the load pickup switch main contacts is adjustable up to a maximum of 30 min. If voltage is removed from the relay, the circuit to the solenoid mechanism is opened after a 20 sec time delay. Upon re-application of voltage to the relay, the load pickup switch main contacts close after a predetermined time which is proportional to the time power was off, up to the adjustable maximum time of 30 min.

Published information indicates that loss of diversity is roughly proportional to outage time up to approximately 20 min. Available data also show that regaining of diversity appears to follow a similar pattern. Thus the energized section of a system would most likely regain its original diversity in a time equal to the outage time for the first 20 or 30 min. It appears that a control relay which closes the load pickup switch in a time proportional

Adapted from paper presented at recent AIEE Meeting

ANOTHER STREET LIGHTING 1ST



Wheeler LARGE METAL HEAD!

NOW! REPLACES PORCELAIN HEADS THROUGHOUT ENTIRE VOLTAGE RANGE

FOR SERIES CIRCUITS UP TO 10,500 VOLTS — dielectric flashover of 27,000 volts makes this new Wheeler Large Metal Head suitable for the highest voltage circuits formerly requiring porcelain heads.

GENEROUS INTERIOR WIRING SPACE — a feature of Wheeler Heads since the first high voltage metal heads were introduced in 1938 — also easy to wire with efficient white interior.

PRODUCED WITH TWO OPTIONAL SIDE MOUNTING ARRANGEMENTS — one for 1 ¼" leveling slip fitter pipe attachment, and one for 1 ¼" threaded pipe attachment, making a less expensive head for use on brackets having leveling provisions, such as the new Wheeler Levelarm.

COMPLIES WITH ALL PROPOSED INDUSTRY STANDARDS — Wheeler Large Metal Heads are provided with lugs to receive all standard reflectors with ring-latch necks. A dual-purpose adapter is available to receive screw-neck reflectors or groove-neck reflectors.

***FOR THE FIRST TIME** — a metal head designed for use on series circuits supplied by constant current transformers of the highest voltage ratings.*

STANDARD FITTINGS AVAILABLE FOR LARGE METAL HEAD

STREET Wheeler LIGHTING

WHEELER REPRESENTS THE MOST ADVANCED ENGINEERING IN STREET LIGHTING.

WHEELER REFLECTOR CO., 275 CONGRESS ST., BOSTON 10, MASS.

to the time voltage was absent in the system would help to restore service with a minimum of outage time and still not cause excessive demand in the system.

Operating voltage for the device can be supplied by a secondary circuit taken from a distribution transformer on the supply side of the load pickup switch.

If the load pickup switch is installed in a series circuit with reclosing equipment and a permanent fault occurs beyond the switch, it will act as a normal sectionalizer, locking out if the fault is persistent. To close the contacts after the fault has been removed, the operating handle is pulled down manually and then released. Any outage other than a persistent fault beyond the load pickup switch will not affect the switch.

If an outage is more than 20 sec in duration, the timing relay will operate to open the closing circuit. If service is then restored, behavior of the switch and reclosing equipment depends on the loss of diversity or accumulation of demand that has taken place. Since the line contacts of the load pickup switch have remained closed, they will not open unless the system is overloaded enough because of loss of diversity and of inrush current to cause the reclosing circuit breaker to operate. If there are no reclosing operations of the reclosing circuit breaker the main contacts of the load pickup switch will remain closed. When the timing relay contacts close at a later time, there will be no further action because the closing solenoid has not been tripped.

On the other hand, if there is enough overload to cause operation of the reclosing circuit breaker, the load pickup switch will lock out, using its sectionalizer functions if it is carrying more than its tripping current. Due to the characteristics of the counter-mechanism the main contacts will open as in sectionalizing operation, while no current is flowing. This disconnecting of load carried by one more load pickup switches will allow the reclosing equipment to energize the remainder of the load without further operations. During the time required for the timing relay to close the load pickup switch, the diversity of the already connected load will have returned to the point where the load pick-up switch may add its increment of load without causing the reclosing equipment to operate.

Currents During Re-energization After 20-Minute Outage

Condition	Current At A	B	C
Full Load before Outage	20	10	10
When Pickup is Attempted	50	25	25
After 20 Min Outage			
Just after Load Pickup Switch Opens	25	25	0
Just before LPS Closes	12	12	0
After LPS Closes	37	12	25

Momentary fluctuations in voltage will not affect the load pickup switch. Opening of the main contacts will be caused only by overloads, provided these overloads cause opening and reclosing of the feeder breaker.

To illustrate the use of the load pickup switch let us assume the system shown in Fig 1, on which the diversity factor is 2.5. One load pickup switch is used, which will allow the load to be picked up in two sections. The requirements are that the load be so divided that the reclosing equipment at A can carry the normal load of B plus the undiversified load of C, and that the ratio between minimum operating currents of the feeder breaker relay and the load pickup counter with respect to the normal load current at each device must be approximately equal. Assume that the maximum permissible sustained load at A is 200% of the rated load. The table summarizes the graphical information shown on Fig 2, which represents recording ammeter records of the behavior of the system in Fig 1.

These illustrations are somewhat idealized in that loadings are assumed to be 100% of rated load, and the branch loads are selected to match the ratings of the associated equipment. However, it should be clear that if the load after an outage is so high it would normally operate the reclosing equipment, it will cause the load pickup switch to operate to divide the load. If the approximate diversity factor is known, it is possible to divide the load into increments which may be picked up successfully.

Heating Cable Clears Fuel Pipes of Tarry Collections

MELTING TARRY IMPURITIES in fuel lines is done by heating cables at Acme Station

Heating cables are now being used at Acme Station of Toledo Edison Co to melt tarry substances which have been collecting in fuel lines during normal operation. These tars result from impurities in the blast furnace gas that is used by Acme as a supplemental fuel.

Previously the accumulations were melted with steam but that method was never completely satisfactory. The new treatment was suggested by Jerry Roux of Acme Station. Heating cables, installed in coils around the fuel lines by Ed Endicott and the electrical maintenance crew, have provided a better solution than the steam system to the problem.

For Any Grounding Connector—
open your Penn-Union Catalog

—you'll find what you need in the Complete line

These pictures will give you an idea of the wide variety offered in the Penn-Union Catalog:

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Every one a thoroughly tested, dependable unit of protection for personnel and equipment . . . of ample capacity, high mechanical strength, and resistant to corrosion.

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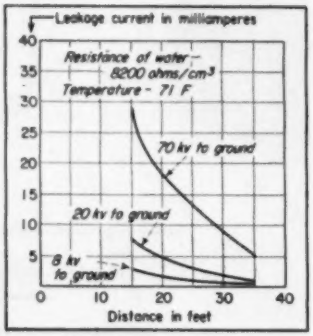
Leakage Current Passing Through A Low-Pressure Water Stream

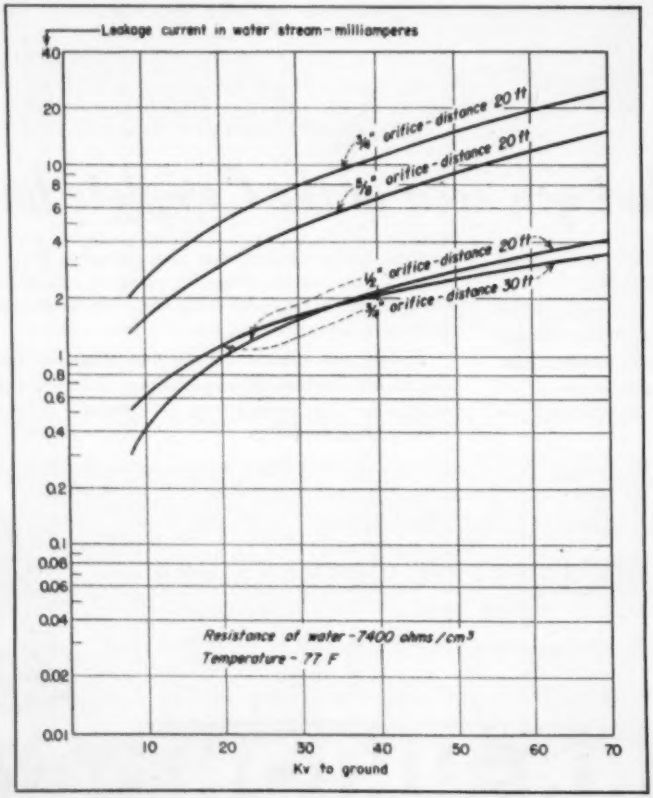
Milliampere values are given for a nozzle pressure of 100 psi, various nozzle orifices, and potentials to ground, also distances between nozzle and energized object

Data are applicable in washing energized line insulators, also bushings on transformers, regulators and oil circuit breakers. Tests have shown that the low-pressure water stream method of washing insulators is both practical and economical.

Insulators on energized lines, 13 kv and up to 120 kv phase-to-phase (8 kv and up to 70 kv phase-to-ground), may be washed effectively and safely with water pressures of 100 to 200 psi and nozzle orifice diameters from ½ in. to ¾ in. However, from a viewpoint of water economy in addition to effectiveness, the insulators should be washed with a nozzle orifice diameter not greater than ½ in., water pressure of 100 psi and a water flow of 75 gpm or less. Except when the washing distance is greater than 35 ft (geographic reasons) or the wind velocity is of the order of 15 to 35 mph, an increase in the above parameters will result only in a waste of water.


Leakage current in milliamperes
Resistance of water - 8200 ohms/cm³
Temperature - 71 F
70 kv to ground
20 kv to ground
8 kv to ground
Distance in feet

LEAKAGE CURRENT passing through a water stream from an energized screen to a nozzle with ¼-in. orifice and 100-psi nozzle pressure.


Leakage current in water stream - milliamperes
¾" orifice - distance 20 ft
5/8" orifice - distance 20 ft
½" orifice - distance 20 ft
¾" orifice - distance 30 ft
Resistance of water - 7400 ohms/cm³
Temperature - 77 F
Kv to ground

LEAKAGE CURRENT in a water stream obtained from a nozzle having various orifice sizes and 100-psi nozzle pressure when washing energized line insulators

Proper safety precautions should be taken while the washing is in progress. If ground connections of the washing equipment are broken and the required washing distance schedule has been observed, the leakage current in the water stream would not exceed 8 to 9 ma. This current value is determined for a 15-ft distance from nozzle to energized 13-kv, 26-kv and 33-kv lines and 30 ft distance to 120-kv lines. Since an acceptable safety factor is to be provided the minimum washing distances should be increased to 20 ft and 35 ft respectively for lines of these kv ratings.

Adapted from a conference paper "Live-Line Insulator Washing with a Low-Pressure Water Stream" by Irvin F. Freed (Consolidated Gas Electric Light & Power Co) presented at AIEE Middle Eastern District Meeting, Baltimore, Maryland

Here's the solution!

CHANCE *Aluminum General Purpose* Hot Line Clamps

Two body styles with proven mechanical features

These new general purpose clamps are available in both the P.C. (Protected Connection) and Perma-Grip design—you get the same service proved features that have made Chance Tap Clamps an industry standard.

NOW... an Aluminum-Body Hot Line Clamp that can be used for all types of connections

These new Chance multi-purpose tap clamps are the result of a newly-developed method of coating aluminum with a high-density fortified cadmium.

The strong cast aluminum bodies are *light in weight*—easy on the conductor because they reduce conductor fatigue—easy to handle on a clamp stick. Contacts stay *tight* — the thermal expansion of the clamp is uniform with aluminum conductor . . . and, since the thermal coefficient of copper is less than that of aluminum, the clamp will not *deform* copper conductor even under extreme temperature variations. The conductor is protected at all times.

The cadmium coating—fortified with chromium chromate for extra long life—wards off corrosion and electrolysis in all types of connections . . . aluminum to copper, aluminum to aluminum, copper to aluminum, and copper to copper. With Chance Aluminum General Purpose Clamps you can eliminate confusion and the chance of error in connector applications—you can reduce inventories — and you can greatly simplify stocking problems.

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

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SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

In addition to these two complete lines, Chance Parallel Groove Clamps are also available in cadmium-coated aluminum for general purpose connections.

C52-16

SAFETY TAGS are used for separate functions: operating permit (left) authorizes equipment to be operated under certain conditions; caution order (center) warns of abnormal or hazardous conditions; and construction order (right) designates equipment to be worked on

Eight Rules for Safe and Efficient Tagging

1. Make scheme applicable throughout entire system and broad enough to cover every condition
2. Keep within limits of easy understandability and reasonable simplicity of use
3. Provide one type of tag for each function and use separate colors for different functions
4. Supervise scheme rigidly through responsible authority
5. Enforce rule that all lines and equipment must be considered energized unless designated otherwise
6. Use written instructions to cover use of tags. If instructions cannot be applied to a certain practice, either instructions or practice should be changed
7. Provide workable scheme from viewpoint of load dispatcher and workman in field
8. Have load dispatchers and operators keep written records of switching and tagging operations

T. C. MONTGOMERY, West Penn Power Co, Pittsburgh, Pa.

Protect Men and Equipment With Safety Tags—II

Protection of equipment from damage and designation of abnormal conditions are the second and third aims of a safety tagging scheme developed by West Penn Power System. In the first part of this article (EW, Aug. 25, 1952, page 112), use of three tags to protect men working on de-energized equipment and lines was discussed. In addition, eight rules for safe and efficient tagging, reprinted above for emphasis, were presented.

Caution Order . . . A white tag with red printing is used to indicate the existance of abnormal conditions such as failures, hazards, or temporary changes in operating rules. This tag may be placed on either energized or de-energized equipment and may be issued either to a person or simply to designate an operating condition. When a caution order tag is issued to a person, and the breakers controlling the associated line or equipment trip, operators are not permitted to close breakers until that person reports in.

Equipment on which a caution order tag is placed may be operated only upon a direct order from the load dispatcher. Tag may not be removed and equipment may not be returned to normal operation except with the approval of the load dispatcher.

Operating Permit . . . A green tag with black printing is used to authorize persons working on equipment to operate it under certain conditions and to designate the equipment which may be operated. Its sole purpose is to permit an operation which would be prohibited otherwise. It is the only tag that authorizes such operation.

An operating permit tag may be placed on either energized or de-energized equipment, either alone or with a release order tag. It is used alone to permit operation when the equipment is not necessarily de-energized and with the release order when the equipment must be de-energized while being operated.

Equipment bearing an operating permit tag may be operated only by or under personal direction of the person to whom it is issued. However, this person cannot operate equipment from a switchboard and cannot energize released equipment.

Construction Order . . . A blue tag with black printing is used to designate equipment under construction in the vicinity of equipment in operation to prevent accidental work on wrong equipment. This tag is really not an operating tag but is intended for use by construction organizations which may not be familiar with operating and safety rules.

A construction order tag will not be issued unless equipment involved is isolated from all possible power sources by an opening other than the normal isolating equipment. A construction order removes equipment from normal jurisdiction of operating personnel and permits construction men to work on, move, operate, or energize the equipment at will. However, they may not energize it from the system or operate it from a switchboard in service.

The entire tagging scheme is supervised by the system operating department, which designs tags and issues

Adapted from a paper presented before the Systems Operation Committee of the Pennsylvania Electric Association.

HI-TENSION NEWS *Junior*

A METAL WITH *Guts!*

What story does this piece of bent iron tell?

Every pot of castings that goes through the annealing ovens in the O-B malleable iron foundry contains one or more of these test bars (appearing above about natural size). When the pots are unpacked after treatment, the bars are bent by hammering to the shape shown here.

It may be hard to believe that a piece of CAST IRON could be so ductile, yet this is typical of O-B transmission line hardware. This is why O-B clamps can stand abuses far "above and beyond the call of duty" when the occasion arises.

Something the test bar doesn't show is malleable iron's great resistance to corrosion. Unlike steel and most other ferrous metals that go through continuous cycles of rusting and flaking away -- leading ultimately to serious weakness -- malleable iron tenaceously retains its original oxide coating, thus forming a natural protective layer that science has yet to equal for downright durability.

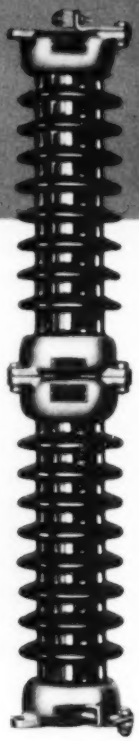
To be sure that the malleable iron used in its transmission line hardware is uniformly fine, O-B produces this material in its own foundries where every step of the process is under full control.

With full control to guard consistent quality, O-B malleable iron exhibits a surprising combination of strength and durability which it imparts to transmission hardware. You can put complete faith in "this metal with guts!"

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*



LIGHTNING ARRESTER PROTECTIVE MARGIN:

HOW DO YOU MEASURE IT? WHAT'S IT WORTH?

Inherent natural variations in materials and factory processes cause lightning arresters, like any other mass-produced product, to deviate from an absolute value. How much do arresters deviate, and what difference does it make?

Considering the IR discharge voltage of an O-B Thorex lightning arrester, excellent production conditions combined with high-precision manufacture of valve blocks, makes possible the unusually small tolerance of only +5 per cent. An average value won't define this. The actual performance of a lightning arrester is, in most cases, one side or the other of the average point. Average value was once the only catalog rating given an arrester. Some arresters are better than average, protection-wise; some not as good. When you are looking at just one, what is it? Averages won't tell you.

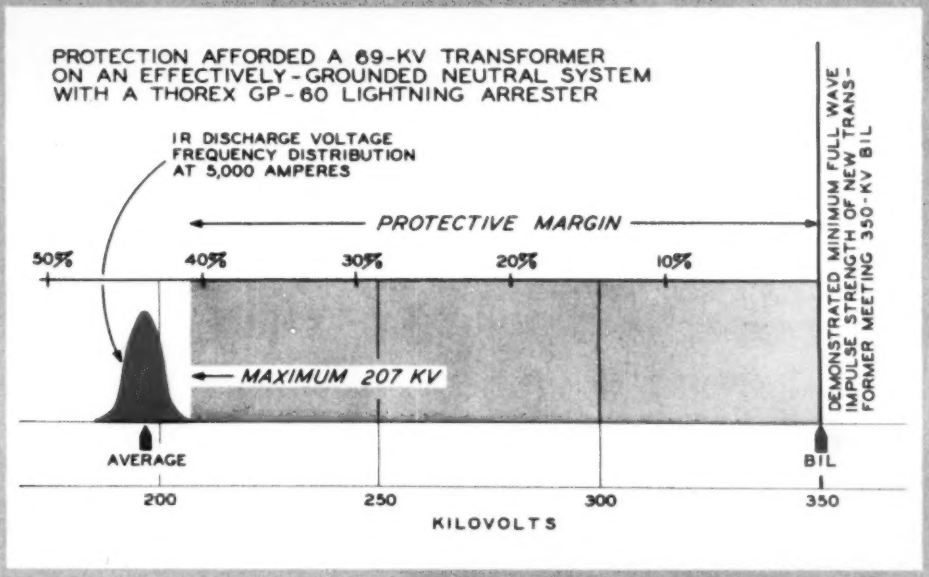
Furthermore, if tolerances are greater with the same average, the base of the frequency distribution curve spreads, and the high end invades the protective margin. It is also a matter of free choice of the manufacturer where the entire distribution curve stands on the kv scale. Match up these possibilities -- broaden the curve and position it higher on the kv scale, and you can take away a large area of the protective margin that can't be spared.

Why? The figure shows over a 40 per cent protective margin for the GP-60 Thorex. Is every bit so vital?

It might *not* be if the BIL strength of every transformer was up to par. Older equipment may have been manufactured to lower insulation standards. Age or abuse, or both, can move the BIL value far down the scale, to a degree difficult to evaluate. Even recent apparatus is often the victim of overloads or deferred maintenance that can lower the BIL. For technical accuracy, the right-hand end of the figure (BIL) is a sharp line -- in practice it may be *anything but!*

Every ounce of arrester protection is worthwhile, and the only conservative bench-mark in measuring this protection is the **MAXIMUM** value -- the high end of the frequency distribution curve. Assuming only this single arrester in every case, as O-B does in its catalog listings, you know positively that every Thorex arrester, out of any number, is equal to or better than published maximum values.

Investigating the matter further you will find that the O-B Thorex is a brilliant performer, and gives by far the most protection per dollar.



This group of Thorex arresters was stacked to illustrate, schematically, the well-known, bell-shaped frequency distribution pattern of natural variations. Because Thorex IR discharge voltage tolerance is only +5 per cent, the shape of the curve is exceptionally tall and narrow for lightning arrester characteristics. Even so, only 16-2/3 per cent of the specimens fall into the central "average" cell. The others are either better than average, or not as good. Ultimately they reach point "C," the MAXIMUM unit that inspection will pass. This unit, however, is the only one taken into account in O-B's catalog listings. A small silhouette of this distribution curve appears in its proper relation on the kv scale in the accompanying figure.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

How Can You Be Sure To Get More Than 5 Years Out Of This Insulator?

Do you expect more than five years' life from this six-inch suspension insulator when installed on a primary distribution deadend? We know the answer. But, are you sure you'll *get* it?

One six-inch unit will handle up to 4,000 volts. In view of the fact that urban power demands went up 9.8 per cent in the single year 1951, and 45 per cent in the last five years, does this 4,000-volt level look like the "ceiling" for primary lines? Many excellent authorities say 12,000 volts is going to be common, and soon.

Pass the 4,000-volt point, and your single six-inch suspension deadend will require rebuilding with a second unit. This may be done hot. It will take the time of an entire crew. Approximately five inches of sag must be removed from the conductor because of the insertion of a second insulator. What do you figure this will cost?

The single six-inch insulator may be as good as new, physically, but its useful life is ended -- the point must be rebuilt -- and it could easily happen in less than five years.

All of this cost and trouble could be avoided by the expenditure of less than two dollars when the deadend was originally installed. Simply add a second unit. The job will never again be nearly as cheap, and the ultimate need for that unit is almost certain.

Honestly, doesn't this second unit make a lot of sense?

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4235-

rules covering their use. General authority over the application of the scheme is given to the load dispatcher. With certain stated exceptions, no tags may be placed without his knowledge and permission.

As a check on proper authorization for placing tags, a separate number is issued to cover each release, caution order, and operating permit (described in Part I). This number is issued by the load dispatcher and is recorded on each tag used.

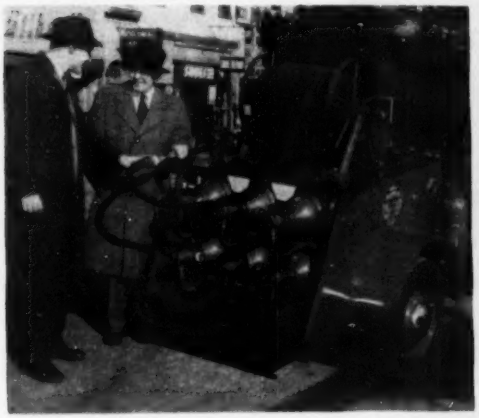
Dispatcher's File . . . As an additional check the load dispatcher records release numbers or caution numbers, name of person to whom issued, time reported on and time reported clear. This record is kept on the dispatcher's desk until all persons have reported clear and line or equipment has been returned to service. Each station operator involved also records similar data in his log.

Station operators usually are authorized by the load dispatcher to perform switching and issue tags, without supervision, on equipment in their station and on lines of less than 20 kv which can be energized only from their station. Chief engineer of a power station, or a person authorized by him, assumes the load dispatcher's duties in supervising and tagging all equipment of less than 20 kv within the power station.

Other Safety Factors . . . On the West Penn system, all persons who issue orders or give reports are required to use a standard terminology which may be varied only as required by local conditions.

The authorized equipment names must be used and these must be checked with equipment signs before an order is executed. No order is effective and no report is accepted until it has been repeated exactly as heard and approved by the words "that is right."

To assure that only capable persons perform switching and work, an eligibility system is maintained which consists of a card index listing each authorized employee, class of switching or work he may perform, and any territory to which he is limited. No person may perform switching or have any operating tag issued to him unless he is on the eligibility list. A course of training by and approval of an operating instructor are requirements before the name of any employee can be placed on this list.



FIRE-FIGHTING TRAILER (above) has six 50-lb carbon dioxide cylinders which can be discharged into transformer vault through 100-ft hose connected to sidewalk coupling (above right). Trailer also carries four portable extinguishers, three fire-retardent blankets

Fire-Extinguisher Trailer Protects Transformer Vaults

WALTER E. MORGAN, Manager, Industrial Division, Walter Kidde & Co, Inc, Belleville, N. J.

E. F. WEAVER, Superintendent of Tests, Pennsylvania Power & Light Co, Hazelton, Pa.

Fire protection for oil-filled transformers and switching equipment in 48 vaults in the heart of Harrisburg is provided by one trailer fitted with cylinders of carbon dioxide. This portable unit is garaged adjacent to the underground network area and can be towed to any vault within a very short time, depending on traffic conditions, after a fire is detected.

A survey showed that while vault dimensions and installation details varied somewhat, all vaults were below ground level, of steel and concrete construction, and could be reached quickly and serviced by one portable fire extinguisher kept in a central location. For this use a trailer was fitted with six 50-lb cylinders of carbon dioxide arranged for a simultaneous, initial discharge of three of them, with the second bank normally held in reserve.

For a fire in the largest vault, where more than 150 lb of carbon dioxide is required for total flooding, both banks of cylinders would be discharged initially, quickly flooding the entire vault.

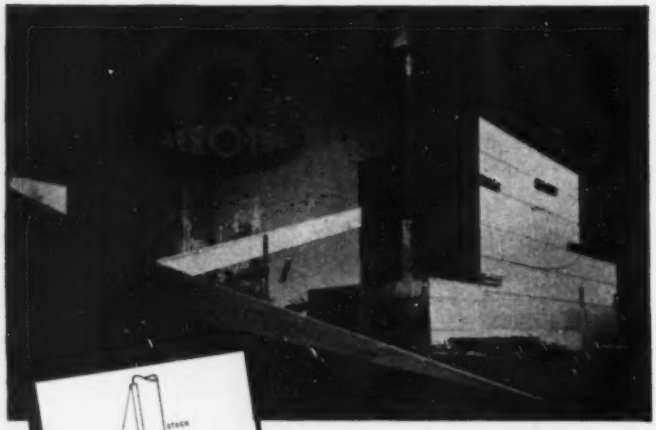
Trailer carries two 15-lb portable carbon dioxide extinguishers, two 2½-gal cartridge-operated plain water units and three fire-retardent-treated blankets large enough to cover ground-level vault ventilation grills. An auxiliary, manually controlled, carbon dioxide discharge horn is also carried.

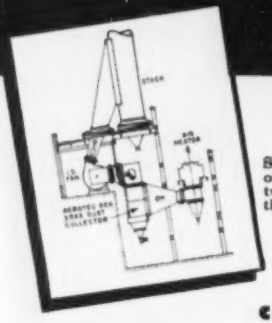
On top of the trailer and connected

another power plant application of the

AEROTEC DUST COLLECTOR

promoting better community relations





Riverton Station
Northern Virginia Power Company

Sectional drawing shows location of AEROTEC Dust Collector between air heater and I.D. fan at this Riverton Station.

Promote your community relations

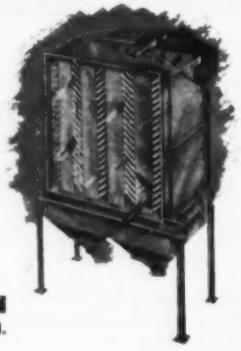
the highly efficient Aerotec way

A clean stack has proven time and again to pay valuable dividends in community good will. To gain this advantage, plus plant erection and maintenance economies, public utilities are specifying the Aerotec Design 3 RAS Dust Collector. This unit develops a higher centrifugal force through the use of multiple, small-diameter tubes, resulting in exceptionally high efficiencies on ultra-fine dusts.

Flexible and space-saving

The tubes are permanent mold aluminum and closely nested to provide lighter weight and more capacity per square foot of plan area than any collector of comparable efficiency. They are set at a 45° angle on vertical tube sheets, factory-assembled into lightweight "building block" sections that reduce installation time and permit the Aerotec Design 3 RAS to be easily tailored to fit available space.

Our field engineers specialize in solving flyash collection problems and welcome the opportunity to assist you at any time. Call or write. No obligation.



Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 38 Principal Cities)
Canadian Affiliates: T. C. CHOWN, LTD.
Montreal 23, Quebec Toronto 5, Ontario

THE AEROTEC CORPORATION
GREENWICH, CONN.

to the carbon dioxide supply is a 100-ft hose reel. Discharge end of the hose has a quick-change coupling which locks over a sidewalk-level curb-box connection to piping leading to nozzles in vault. This hose coupling also fits the discharge horn.

If fire occurs, the trailer is towed to the vault by an available vehicle. At the scene the blankets are thrown over air vents. The plate covering the piping connection is unscrewed with a tool carried on the trailer. Hose is unwound, drawn to the curb-box, and female hose coupling snapped over the pipe. Carbon dioxide under its own pressure is discharged into the vault.

In vaults equipped with forced ventilation, pressure of carbon dioxide in the piping actuates a pressure switch which shuts off the fan motor. Should the intense heat cause a re-flash, reserve bank of three cylinders is available in most cases for discharge. In actual tests one man handled the entire operation and had the vault flooded within 60 sec.

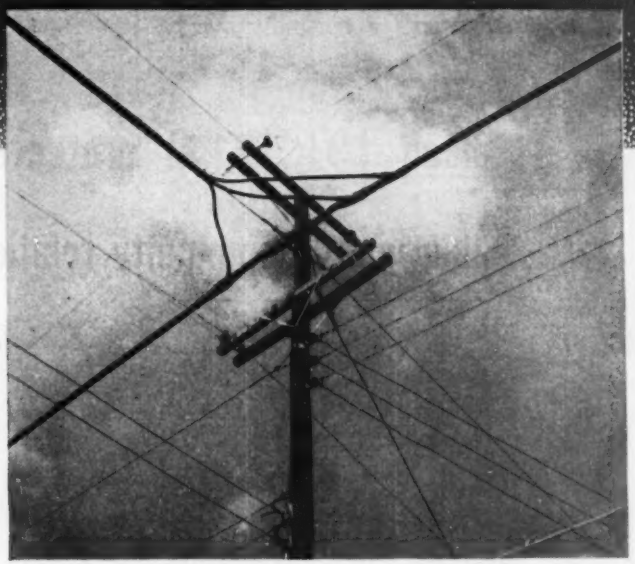
It is felt that even though there may be as much as 15-min delay from the time the fire breaks out until the trailer arrives on the scene, due to traffic congestion or other circumstances, the apparatus will still be able to put out the fire. The trailer, with its horn attachment, is always available for emergency use on other fires that may occur on electric apparatus in switchyards, transformer stations (above ground) or power plants that are only a few minutes distant from the central location.

Fabricated Steel Streetlight Standards

W. J. BISHOP, General Manager, Board of Light and Heat Commission, Guelph, Ontario

To replace battered castiron street standards, the Board of Light & Heat, Guelph, Ontario, has turned to prefabricated steel to provide standards that are strong, durable, and require little maintenance. The standards are open in structure so that moisture is not trapped inside them to cause rusting. Wiring from the lamp runs through a pipe to the cables below ground. Pipe is fitted with ordinary weatherproof sockets. Standards are painted with rust preventive coat and final coat of green enamel, and globes

DO YOUR OVERHEAD LINES LOOK LIKE THIS?



This photograph shows many of the reasons why you should consider installing aerial cable instead of line wire. Notice what a neat, compact job the linemen have done and how unobtrusively the cable fits into the picture. Wouldn't you like your overhead lines to look like this?

It is a safe job too because the cable is completely insulated. Even if the cable should fall, which is highly unlikely, there is little or no danger to passers-by. Experience has shown that insulated aerial cable is the safest form of above ground transmission. Wouldn't you like that?

Notice how flexible the installation is too. See what a good looking "Y" tap has been taken off and notice the streamlined appearance of the splices. There is little danger here from swinging arcs or grounds caused by wet conditions. This type of an installation will reduce your trouble calls from owners of television sets. Wouldn't you like to increase safety and cut down on customer complaints?

Insulated aerial cable leaves the pole in an uncluttered state. Wouldn't you like to leave the impression with your customers that you practice good housekeeping?

These advantages and more can be yours if you use Simplex Aerial Cables. You will find that they are exactly what you want. They are made in various styles and sizes to meet varying conditions. Want more information about these versatile distribution lines? A note to the address below will bring it to you without obligation.

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.

clean penta* protected poles

build good community relations

When you treat your poles with PENTA, the *clean* wood preservative, you are building good public relations.

Clean full-length PENTA protection for poles and crossarms also reflects sound management since PENTA effectively lengthens wood life many times—cutting repair and maintenance costs to save you money!

More than 60 commercial treating plants can supply you with poles and crossarms treated with PENTA. A Dow technical representative is also available to you in solving your wood preserving problems. For *clean* protection, for positive protection . . . depend on PENTA!

THE DOW CHEMICAL COMPANY · *Midland, Michigan*

The Dow Chemical Company
Dept. PE 13, Midland, Michigan

- ☐ Send me free booklet "Pointers on Penta".
- ☐ Send me a list of Penta treating plants.
- ☐ Please have technical representative call.

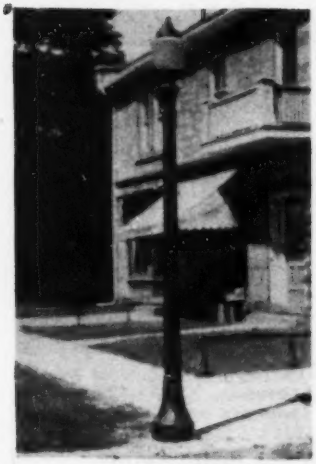
Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
penta
CHLOROPHENOL



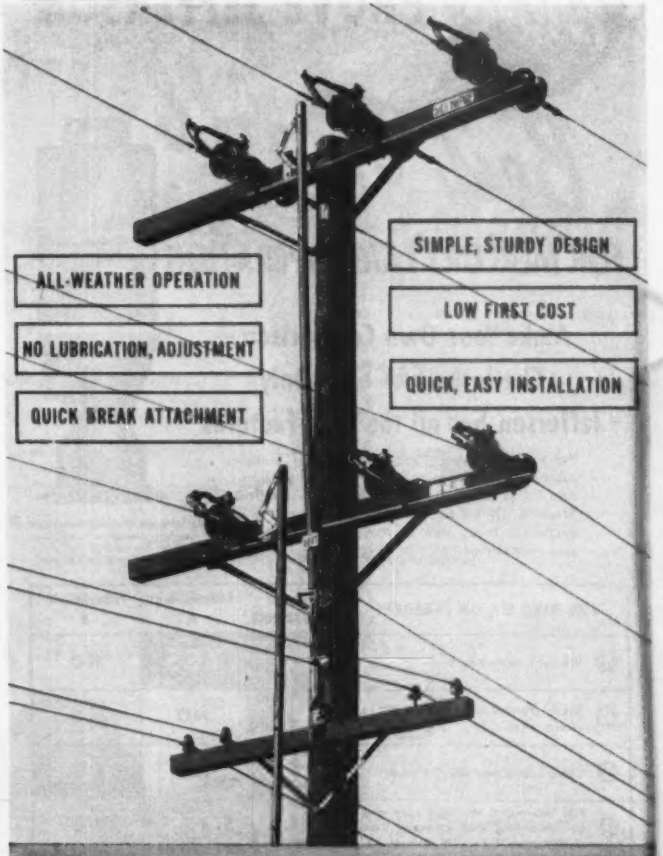
CAST IRON STANDARDS required frequent repair because of automobile damage

PREFABRICATED and weatherproofed, steel-frame streetlight poles are strong and sightly

and fittings from the old street lights were installed in the new standards. Cost per standard, including material, was about $60. Poles were fabricated locally.

The new poles were made to the size of the obsolescent castiron poles. Because of the density of trees and low branches, modern steel standards and brackets would have meant relocating the mounting bases and reconstructing underground cables, as well as trimming overhanging branches. The new poles avoided these costs and problems and satisfy the city both in function and appearance.

KPF POLE TOP SWITCHES



MORE SWITCH FOR LESS MONEY

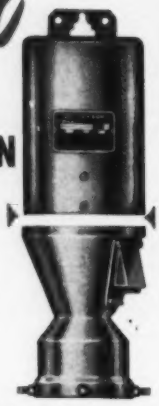
KPF Pole Top Switches cost less to buy and give longer service because they are simplest in design, sturdily built. They need no separate deadends, no "extra" insulators. Simple "3-step" installation saves man hours—(just bore holes in cross-arms, tighten bolts, attach connectors). Insulator stacks easily adjusted for line sag. Free-floating, self-aligning, silver-surfaced blades always maintain proper contact. Vertical, horizontal or triangular mounting. Write today for Catalog, details of KPF switches.

KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton 5, Calif.

FACTS PROVE JEFFERSON *Best of All* FOR MERCURY LAMP OPERATION

Make Your Own Comparison—
Check the FACTS—Only
Jefferson has all the Vital Features

Nine *major* design and construction features *vital to top-flight transformer service, economy, and ideal lamp operation are listed below.* Modern *up-to-date* Jefferson Transformers incorporate *every one* of these features to give you *unmatched* value in every detail.



Jefferson Transformers are quickly converted to pole-top units by adding Jefferson patented universal adaptors.

THE NINE MAJOR FEATURES	JEFFERSON TRANSFORMERS	Transformer A	Transformer B
❶ Press-fit riveted core	YES	YES	NO
❷ Leads stapled to core for positive strain relief	YES	NO	NO
❸ Color coded and tagged leads	YES	NO	YES
❹ Full sub-panel for rigid core and coil mounting with stamped lead designation	YES	YES	NO
❺ Hot-dipped galvanizing on all outdoor types	YES	NO	NO
❻ Deep Drawn cases on all outdoor types	YES	NO	NO
❼ Solidly welded mounting bracket with locking holes plus key slot	YES	NO	NO
❽ Universal Pole-Top Adapter for 2½-4" O.D. Poles (a stock reducing feature)	YES	NO	NO
❾ "Dura-Grey" harmonizing finish for modern, attractive installations	YES	NO	NO

For complete details and data on both outdoor and indoor type Jefferson Mercury Lamp Transformers, write for 16-page illustrated Bulletin 521-5. A copy is yours on request.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

JEFFERSON **TRANSFORMERS**

PAINTING HEAVY EQUIPMENT in a spray booth frees shop area of paint fumes, results in better paint surface

Spray Booth Paints Better and Faster

F. A. **REDDING**, Supt, Shop & Test Division, Southern California Edison Co, Alhambra, Calif.

Paint spray booth built by Southern California Edison Co offers these advantages: a better and faster job compared with the flow-on method; longer lasting protection due to use of paint containing less thinner; and elimination of paint fumes and vapor in surrounding work areas. Because it releases no paint particles into the atmosphere, the booth meets with the objectives of the Los Angeles County air pollution program.

Booth consists of two solid walls and a ceiling containing recessed lighting. Third wall is comprised of a solid portion and a water curtain through which paint-laden air is drawn. Fourth wall consists of large doors through which equipment moves.

Transformers up to 25 tons are carried by overhead crane to a transfer car which is then pulled into the booth by a motor-operated winch. In the booth the car rides on a turntable which can be rotated remotely by the spray operator.

A boom crane on one side of the booth is capable of handling fully assembled distribution transformers. These units are suspended from the crane so that their entire surface may be painted in one operation.

During the winter, doors of the booth are closed and air is drawn in from a port on the roof. This eliminates drawing heated air from adjacent shop areas into the booth and discharging it to the atmosphere.

FINEST DISTRIBUTION PINTYPES EVER MADE

THANKS TO VICTOR PURIFIED PORCELAIN!

There are many reasons why power men are partial to Victor Pintype insulators . . . but the biggest is that they're made of VICTOR *PURIFIED* PORCELAIN—finest insulator porcelain ever made! *PURIFIED* PORCELAIN gives these pintypes a strength and resistance to impact that are unequalled. Puncture values are higher. Uniformity, hardness, density and durability are greater than ever before!

AND, remember, every Victor Pintype is electrically tested before shipment.

***The result*—dependability under *all* service conditions!**

VICTOR INSULATORS, INC., VICTOR, N. Y.

VICTOR NO. 5
DISTRIBUTION PINTYPE

ADVANCE DESIGN FOR
ALUMINUM CONDUCTORS

For the larger aluminum conductors being used today, Victor has increased wire groove sizes on distribution pintypes. For complete engineering data, write today for Bulletin No. 4.

Specify
VICTOR
PINTYPE INSULATORS

ALEC

ALUMINUM SERVICE DRO

Load for load ALECTRAL aluminum service drop and entrance cable is lighter, easier to handle, more readily available and...is less costly than copper. The same is true of certain other aluminum types such as TIP-TOP® weatherproof (illustrated) and aerial power cables. The men who are responsible for specifying conductor materials have come to recognize these advantages now more than ever before.

Perhaps, today, you are confronted with a problem that ALECTRAL Aluminum conductors could completely solve. General Cable Corporation is the largest manufacturer of insulated aluminum wires and cables and is the pioneer in this field. Contact your nearest General Cable office for complete information on ALECTRAL aluminum wire and cable.

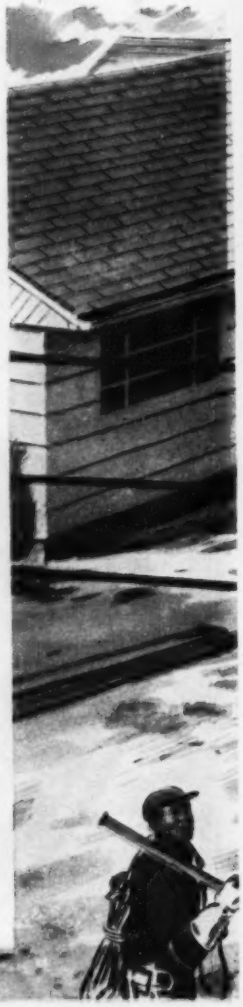
GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVE., NEW YORK 17, N. Y. • SALES OFFICES IN PRINCIPAL CITIES OF THE U. S.

• • •

CHECK THESE IMPORTANT ADVANTAGES OF ALUMINUM SELF-SUPPORTING AERIAL POWER CABLES

- ✓ **SIMPLIFIED INSTALLATION** permits lighter fittings and longer spans.
- ✓ **REDUCED TREE TRIMMING EXPENSE** Maintenance costs are lowered and highway beauty preserved.
- ✓ **GREATER SAFETY** Withstands heavier ice and wind loads.
- ✓ **CLOSER VOLTAGE REGULATION** permitted by lower reactance of cables than is normal with open-wire construction.



GENERAL CABLE GENERAL CABLE

PIONEERS IN ALUM

TRAL®

P AND ENTRANCE CABLE

SUPERSHEATH-N
FOR UNDERGROUND ENTRANCES

- INSTALLS DIRECTLY IN EARTH
- HEAT RESISTANT
- MOISTURE-PROOF
- UP TO 600 VOLT INSULATION

"More Power to You"®

INUM WIRE AND CABLE

MOISTURE REMOVED by a ¾-hp room air conditioner during a single week is represented by the water in this 60-gal fish tank. A sign nearby explains that it would require 1,500 lbs of ice to reduce temperature of average room by the same amount as such a cooler

Utility, Manufacturers, Dealers

Commonwealth Edison hosts to show featuring 50 nationally advertised models of air conditioning equipment

More than 50 models of nationally known room air conditioning equipment are on exhibit at a special show sponsored by Commonwealth Edison Co, in cooperation with 11 manufacturers and distributors. Occupying about 4,000 sq ft of space in the Electric Shop on the ground floor of the Edison Building, the special showing tells the story of air cooling in several ways. Commonwealth officials say display has had much to do with the fact that 10,000 air cooling units were sold in Chicago this year.

The show has run through the summer, and is being supported by an extensive advertising campaign. Inaugurated in May, the promotion was kicked off with a 1,500-line advertisement in Chicago's daily newspapers.

Manufacturers who pitched in to place their models on display are Carrier, Crosley, Fedders, Frigidaire, General Electric, Mitchell, Philco, RCA, Remington, Vornado, and York.

Many Specialties . . . Supplementing the product displays is a veritable sideshow of special exhibits.

One of them features a 60-gal gold-

MASCULINE ATTENTION is focused on one of the manufacturers' models with covering removed to show what makes cooler tick

A FEW INSTRUMENTS used by meteorologists in forecasting the day's weather are examined by three visitors to summer-long show

WEATHER CONSULTANT Denny Trettel illustrates to audience what accounts for the climatic conditions in the Windy City area

AIR COOLERS also do a job on dust. Here a few persons express amazement at bottleful of particles picked up by a conditioner

Team Up in Air Cooling Display

fish "bowl" over which is a sign explaining that that much moisture is taken out of the air by a ¾-hp room cooler in one week. Nearby a cake of ice lies in a pan. Below it, a sign states that it would require 1,500 lb of ice to reduce the temperature in a room by the same amount as a ¾-hp cooler.

Another exhibit includes two shower stalls, into each of which the same amount of moisture is pumped by electric humidifiers. A meter in one of them shows a humidity of 60 to 70%, while the other shows 30 to 40 points less because an electric dehumidifier, operating in the same way as a room cooler, is removing the moisture from the air and dropping it into a glass jar.

Also on display is a miniature model of the first "air conditioner," invented by Leonardo da Vinci. It was installed more than four centuries ago in the boudoir of Beatrice d'Este, wife of Leonardo's patron, the Duke of Milan.

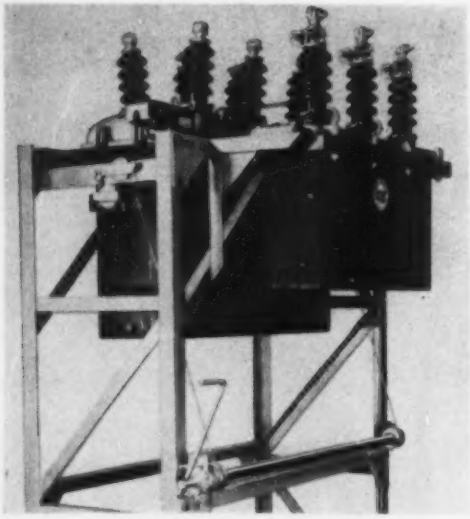
Predictions Predominate . . . Weather forecasting also has played a prominent part in the Windy City show. During the first two weeks, "Weather Expert" Denny Trettel, an industrial meteorologist, explained where Chicago weather comes from and what makes it like it is.

Weather forecasting and communications equipment includes two teletypewriters. One furnishes local reports every hour on the hour, and the other, typing in code, notes conditions in other parts of the country. A radiosonde balloon, five feet in diameter, of the type used for upper atmosphere observation, floats over the other equipment.

Special showings accompanying the regular activities have included a program featuring the Percy Puppeteers; a magic act conducted by Bob Sharpe; and an ice sculpturing specialty conducted by Ralph Arriage, pastry chef at the Morrison Hotel. Topping it off is a miniature theater, seating 30 persons, which features travel and variety motion pictures.

SEVERAL of the 50 nationally-advertised air cooling units on display at the Chicago show, which has played a significant part in selling 10,000 conditioners in Chicago during year

NEW EQUIPMENT

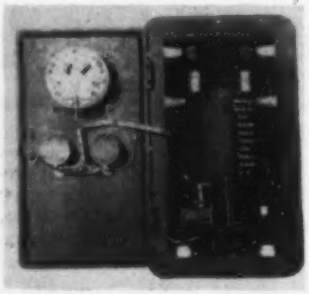


Heavy Duty Recloser

This three-phase oil circuit recloser is designed specifically for distribution lines where high fault currents may occur. The Type R protects against system outages due to faulted feeder circuits and through three-phase tripping prevents possible feed back through three-phase loads. All opening and closing operations are simultaneous for all three phases.

The nominal load ratings are 25-280 amp; maximum interrupting rating 6,000 amp on systems to 4.8 kv and 4,000 amp on systems to 14.4 kv, using the oil cross-blast principle. Pole or station mounted, the unit is completely automatic and self contained. The mounting frame for substation application has a tank lifter to facilitate inspection of the unit without demounting.

Line Material Co, Milwaukee, Wis.



Differential Voltmeter

Basically a high-resistance voltmeter containing an electronic amplifier, the indicator can measure a 0.001-30v differential of two input voltages ranging from 1-400v, if they do not differ by more than 300:1.

With a self-balancing circuit said to be stable and free from drift, the instrument can indicate full scale for 0.022v. Scale can be marked in volts, amperes, feet per minute, etc.

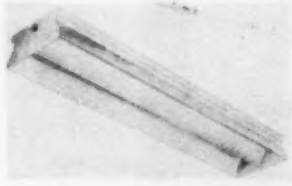
General Electric, Schenectady, N. Y.

Scale Kit

Calibrated illuminated scales for cathode-ray oscillographs facilitate amplitude and time calibration for both visual and photographic applications. Designed for any 5-in oscillograph with the DuMont Type 2501 bezel, the kit contains four incandescent bayonet type lamps with sockets, a bezel, front and rear masks, a plastic rectangular-coordinate calibrated scale and a color filter.

Scale lines are engraved 10 x 10 to the inch, with 1 in. vertical and ½ in. horizontal lines accentuated. Light is diffused throughout the scale by four symmetrically arranged depressions in the scale. The front and rear masks prevent wave-form measurements at the tube periphery where distortions tend to introduce errors. Inside diameter of masks is 4½ in.

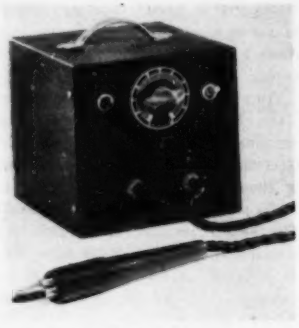
Instrument Division, Allen B DuMont Lab Inc, 1500 Main Ave, Clifton, N. J.



Low Brightness Light

Using 2 T-17 tubes, this unit is made of diffused Alzak aluminum, with parabolic side and center reflectors. As individual fixtures or in rows, ceiling mounted or suspended, the unit is said to illuminate glossy paper without highlights. Suitable for use in offices, libraries, etc.

Leader Electric Co, 3500 N. Kedzie Ave, Chicago, Ill.



Resistance Solderer

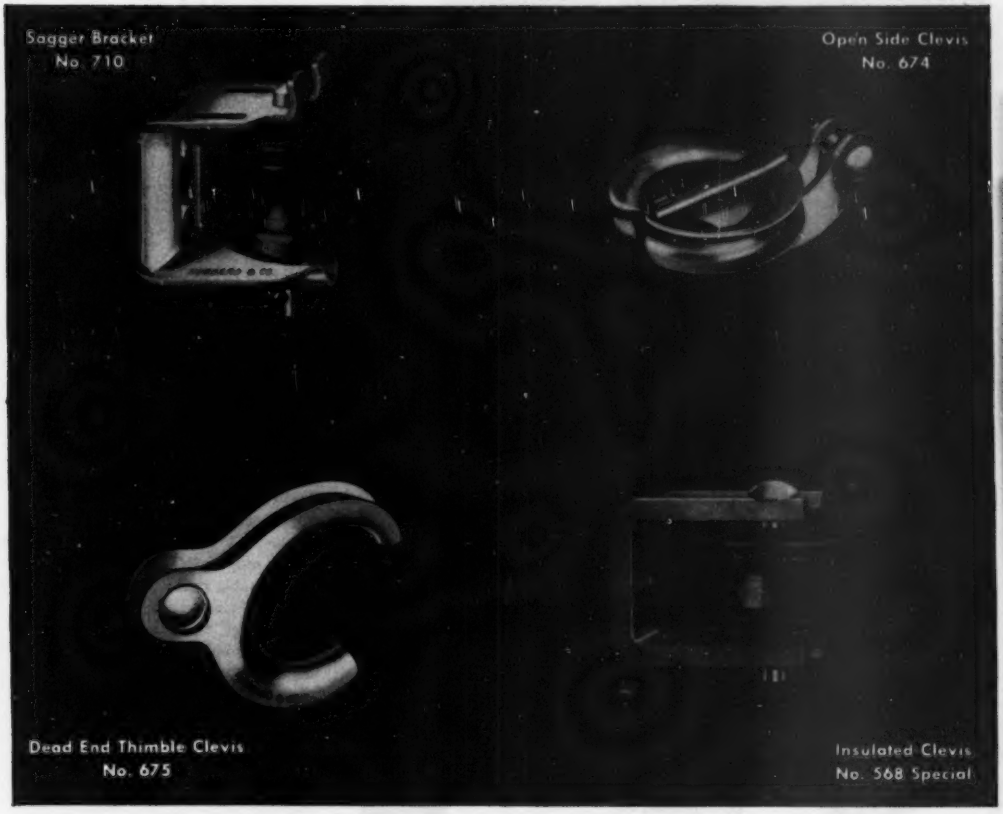
Consisting of a cabinet 6x6x6 in. and an electrode holder and ground clip, this soldering unit weighs 15-20 lbs and operates on 110v 60 cps ac. Said to provide fast precision soldering, the device includes an adjustable heat controller and an interval timer.

Soldering is accomplished by passing a current up to 6 amp through the work. It is designed for con-

for your ALUMINUM SECONDARIES

SINGLE CONDUCTOR OR CABLE

. . . HUBBARD CLEVISES



The increasing use of aluminum for single conductor cables and in ACSR has brought numerous inquiries as to appropriate clevises and other accessories on such lines. Here are a few from a large number of Hubbard items which are recommended for such use. Write for detailed information.

Bermico Fibre Conduit is made from sturdy wood fibre, impregnated with pitch. Its light 8-foot lengths handle easily, quickly. All joints are precision milled for speedy installation. Specially designed couplings won't split. It is water- and acid-resistant, chemically inert. Complete line of bends. Smooth inside bore insures quick pull-through without abrasion. Bermico's quality, uniformity and dependability have made it a standard of the industry for 25 years. For superior cable protection, specify *Bermico* Conduit!

"SAY...THAT'S FOR ME!"

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WESTINGHOUSE

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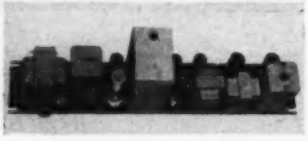
SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

tinuous operation of heavy soldering such as brass and stainless steel.
Sunrise Products Co, P. O. Box 173, Hawthorne, N. J.

Brush Grinder

Designed for a capacity of 2,000-3,000 lb per hr, and capable of handling branches up to 6-in dia, this trailer-mounted unit is said to convert a truckload of brush into a barrel of chips in 21 min. The 25-40 hp engine, with clutch, operates 1800-2400 rpm. Eight cutting knives, on a 20-in dia cylinder, rotate at 1500 rpm against three stationary cutting bars.

All moving parts are guarded and a retractable rack keeps the unit level. Standard ball-type trailer hitch, 6-ply truck tires, tubular axle and leaf springs, demountable 54-in wheels are included. Trailer frame is structural steel channel, welded construction.
Mitts & Merrill, Saginaw, Mich.



Signalling Unit

Consisting of a tone transmitter and frequency selective receiver, the Duplex Signaling Unit is designed to operate over wire lines, telephone or power line carrier, radio or microwave circuits. Units can be used to transmit and receive signaling, dialing, tele-

metering, teleprinting, supervisory controls or other information.

Transmitters and receivers are available on the same or different frequencies between 2,000 or 6,025 cps. Up to 33 channels can be used over a single circuit.

Hammarlund Mfg Co Inc, 460 W. 34th St, New York, N. Y.

Pole-Top Assembly

Ground-level maintenance for lights mounted on new standard metal poles of any height is accomplished with this pole-top unit. The unit incorporates a disconnecting and lowering hanger mechanism. Included are stainless steel cable, self-contained pulley and mast arm. Live contacts stay at pole top, eliminating electrical as well as climbing hazards. Mounting heights are not restricted by maintenance considerations.

Thompson Electric Co, 1114 Power Ave, Cleveland 14, Ohio

Overload Relay

Type TRO thermal overload relay for power transformers is now equipped with an indicating dial calibrated in percent thermal load, giving a continuous visual indication of the thermal condition of the transformer. Coordinated with the relay, the 100%

Clean Penta protection keeps poles healthy!
Penta is certain . . . always the same!
You can absolutely depend on Chapman Penta for clean, certain protection from ground line decay, shell rot, top rot and insect damage. This modern wood preservative contains Pentachlorophenol, famous for its effectiveness, stability and uniformity. Penetrates deeply into the wood and will not leach out or evaporate. Doesn't affect conductivity or cause corrosion . . . creates no special problems. It's cleanliness makes it the favorite with men who climb the poles.
Specify PENTA treatment for safeguarding your poles, cross arms and other wood construction. With all its advantages, it costs no more than other types of preservation. Write for complete facts and names of companies supplying Penta-treated forest products.
CHAPMAN CHEMICAL COMPANY
Dermon Building, Memphis 3, Tenn.
CHAPMAN
TM
Penta Preservative
It's Clean! It's Certain!
Conforming to A.W.P.A. Specifications P8-49 and P9-49.

DOW CORNING SILICONES

make motors last longer

Failure rate on machine tool motors cut from 1 a month to 0 in 2 years!

In a line of 20 turret lathes, piece-work operators at Mueller, Ltd., Sarnia, Ontario, were burning-up drive motors at an average rate of one a month. These lathes were driven by Class B motors, rated at 5 hp at 650 rpm and subjected to 1200 full reversals an hour. Under such operating conditions, 18 replacement motors had to be carried in stock; occasionally all 18 of the spares were called upon to maintain production.

Two years ago, 25 of these motors were rewound with Silicone (Class H) insulation by Canadian Westinghouse Company. Twenty of them have been in service ever since. The 5 replacement motors are still standing by, in spite of the fact that some of the more ambitious operators took the overload capacity of these Class H motors as a personal challenge.

That kind of life and overload capacity, demonstrated in thousands of applications, proves the economy of Class H insulation made with Dow Corning silicones. Capable of putting out 50% more power than their name-plate rating, Class H insulated motors have 10 to 100 times the life expectancy of the next best class of motors under comparable service conditions.

Ask your motor supplier or rewind shop about Silicone (Class H) insulation or write direct to Dow Corning Corporation, Midland, Mich.

Keep Ball Bearings Properly Lubricated

In permanently sealed or cartridge type bearings, Dow Corning 44 Silicone grease makes permanent lubrication a practical reality. In many applications it outlasts the best organic lubricants 10 to 1 in either open or shielded bearings.

mail this coupon *Today*

Dow Corning Corp., Dept. AY-21, Midland, Mich.
Please send me:
- ☐ Catalog of Class H Insulating Materials.
- ☐ List of Class H motor repair shops.
- ☐ Data on Silicone Grease for motor bearings.
- ☐ 32-page booklet entitled "What's A Silicone?"

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DOW CORNING SILICONES

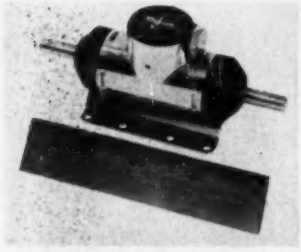
DOW CORNING CORPORATION
Midland Michigan

Atlanta • Chicago • Cleveland • Dallas • New York • Los Angeles • Washington, D.C.
In Canada: Fiberglas Canada Ltd., Toronto • In England: Midland Silicones Ltd., London

position on the dial corresponds to the "signal" position of the relay, and the 110% mark corresponds to the "trip" point.

Dial is readable from ground and has a maximum indicating hand that records greatest deflection of indicating pointer. Maximum pointer can be reset manually from ground. Dial readings range from 60-120% thermal load.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



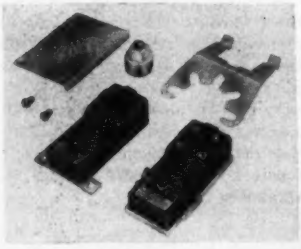
Speed-changer

Weighing less than 6 oz, the Type 3A variable speed-changer, a low power unit, selects speeds whether running or stopped. High output torque, low no-load input torque, good speed regulation claimed.

Applications are in controllers, indicating mechanisms, oscillographs, recorders, timers and similar devices.

Speed is controlled by an adjusting knob equipped with friction drag to prevent ratio wander. A dial and pointer indicate speed ratio. Lever, push-rod, spur gear, miter gear, worm gear speed controls available.

Metron Instrument Co, 432 Lincoln St, Denver 9, Col.



Thermostat

This Type R surface mounted replacement thermostat for domestic

Yes, the Men in Authority couldn't see the need—the *vital* need—for the *right* kind of fire protection. And fire struck, as always, when least expected—devastating fire that destroyed irreplaceable records, costly machines, buildings and supplies which will take months—months of no production—to rebuild and replace.

Statistics prove that too many fires result from failure to be ready for them—particularly in generators, transformers, switching and other electrical equipment.

Are *your* operations safe? A survey by Cardox will show you how CARDOX "Low Pressure Carbon Dioxide Systems"* can protect the danger spots in your plants against fire—eliminate fire extinguishment losses entirely. A few lines on your letterhead will bring full, eye-opening information.

*Covered by Patents Issued and Pending

CARDOX

ORIGINATOR OF Low Pressure CO_2

FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

Offices in Principal Cities

Look to
LARCH
for better
POLES

produced · treated · sold by
J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

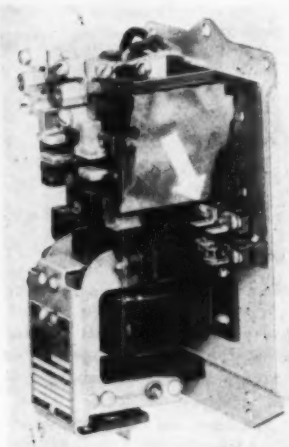
An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

***Double-Life** Western Larch Poles*

J N *J. Neils Lumber Company*
Pole Division: LIBBY, MONTANA

electric water heaters has a temperature range of 120-180 F. Design includes solid silver contacts, positive contact and breaking. Tests claim no flashover or damage to thermostat with successive lightning surges up to 7,000 v.

Temperature differentials are set to latest NAMA standards. Unit can be clamp mounted, screw mounted or attached to a heat-conducting plug in the threaded tank opening.
Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa.



Electrical Interlocks

A design change in NEMA sizes 2 and 3 contactors and starters simplifies changing, adding and removing interlocks used to operate pilot lights or other signalling or protective devices. All mounting screws for interlocks may be added from front of starter.

Interlocks consist of an insulating block with a contact mounted on it, contactor with movable contact. As many as five base-mounted interlocks are available for each device. Interlocks may be added or changed with a screwdriver, no wiring change. Complete details in Bulletin 8536-9999.
Square D Co, 4041 N. Richards St, Milwaukee 12, Wis.

Geared Motors

Totally enclosed fan-cooled geared motors are double reduction electric

power drives. They permit offset shafts and are said to provide permanent bearing and gear alignment with uniform distribution of load.

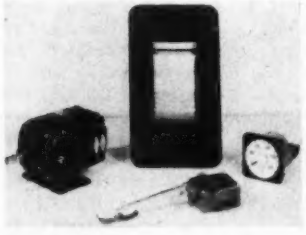
These motors are available with Class I-III gears, in frame size 364/365, with AGMA speed 155 rpm and slower. Ratings 5-25 hp.

Sterling Electric Motors Inc, 5401 Anaheim-Telegraph Road, Los Angeles, Calif.

Soldering Iron

Designed for constant duty, this industrial iron has nickel-chromium mica-wound mounted elements. It is suitable for small instruments and electronic devices. Weighing 3 oz less cord, with ⅛-in. dia. tip, iron is rated at 25w, 110 or 220v, dc or ac.

Hexacon Electric Co, 206 W Clay Ave, Roselle Park, N. J.



Tachometer Kits

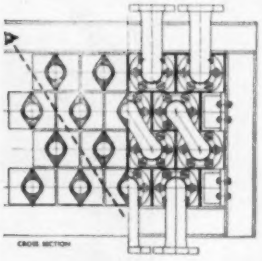
Four new tachometer kits contain components necessary for central checking and recording of equipment operation. They have been designed to eliminate production line trips by supervisors, and also aid preventive maintenance scheduling and prevent exces-

GREEN

PREMIER DIAMOND

ECONOMIZERS

The Economizer with the "Diamond" Design



Here are the four major values in the "diamond" shape of the Green Fuel Economizer:

1... Streamline flow of flue gases gives minimum draft loss

2... Finned tubes give maximum heating surface in given space

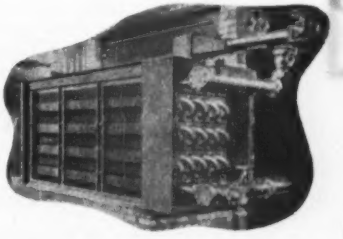
3... Staggered tube arrangement permits easy inspection

4... Minimum soot collecting surface is thoroughly cleaned by Green's "Special" Soot Blowers

Green Premier Diamond Economizers are available in either cast iron tube construction (Type 25) or steel tube construction (Type 12).

Pressure parts are rugged and joint flanges independent of support flanges.

Green Fuel Economizer's reputation of 60 years assures you of satisfactory performance and quality. Send for Bulletin No. 169.



THE GREEN Fuel Economizer COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

KOPPERS POLE
"1914 Model"
still in service!

YOU can't blame the man for admiring this Koppers Pole. It was pressure-creosoted at the Koppers Grenada plant in 1914 . . . 38 years ago.

For such long-lasting service, and lowest cost per year, specify Koppers Pressure-Creosoted Poles. It's a buying practice that will show results in better operating records.

KOPPERS COMPANY, INC.
PITTSBURGH 19, PA.

KOPPERS **PRESSURE-CREOSOTED WOOD**

sive manufacturing losses by automatically shutting down machinery in case of breakdown.

The kits include a dc tachometer generator, a tachometer indicator, a switchboard-type recorder and where necessary a web-break detector. Audible or visual alarm systems are optional accessories. Further information is contained in Bulletin GEC-816. **General Electric Co, Schenectndy 5, N. Y.**

Pilot Device

Called Flexi-Switch, this mechanically operated pilot device is designed for controlling relays, motor starters, solenoid valves, etc. Said to be particularly adapted to operating switches, stops, feeders, automatic transfers on conveyors.

Characteristics: 72 positions in 360 deg. arc for actuating arm, two snap-action SPDT switch elements rated at 15 amp, 120 vac, arm rotation of 10 deg. in either direction operates contacts. Housing and cover are aluminum castings.
Jervis B. Webb Co, Detroit, Mich.

MORE NEW PRODUCTS
about which you should know

Square D Co, 4041 N. Richards St, Milwaukee 12, Wis, offers a Class 2601 Type A **small reversing drum switch,** convertible for maintained or spring-return action; designed for manual reversal of small ac and dc motors. . . . Blonde Oil Co, 464 Woodward Ave, Brooklyn, N. Y., has a 40/60 **tin-lead solder** containing rosin flux, packaged as a metallic tape. A soldered connection can be made with a match or candle. Each 2½ ft x ⅜ in. tape is said to be capable of 100 connections.

Minneapolis-Honeywell Regulator Co, Wayne and Roberts Ave, Philadelphia 44, Pa, has a multiple (2-16) burner **flame protection system** which uses a photocell detector for oil burners and a flame electrode detector for gas or gas-piloted oil burners. The detector

and relay circuits act to shut down the fuel supply in case of flame failure. . . . Minnesota Mining & Mfg Co, 900 Fauquier St, St Paul, Minn, has a spring type **connector** requiring no tools; said to provide a permanent splice for single or multistrand wire up to No. 10.

Crouse-Hinds Co, Syracuse, N Y, developed the type EFHC explosion-proof **lighting fixture hanger,** which is essentially a T fitting with a threaded cover for installing connections. . . . U S Electrical Motors Inc, Box 2058, Los Angeles 54, Calif, announces low-speed right-angle **wormgear motors,** type GW Synchogear, in single housing; speed range 20-155 rpm; motors ¼-3 hp, both single and 3 phase.

General Electric Co, Nela Park, Cleveland 12, Ohio, has a Rapid-Start **fluorescent lamp** which needs no external starter. Made in 40w size, "standard coal white," the lamp lights within one second, reported not to blink or flicker. . . . Meinhardt Cleaning Materials Co, 2314 Van Buren St, Chicago, Ill, announces a **fence painter** package, including enamel paint mixer and applicator, said to be economical and fast, as well as preventing excess paint being spilled. Wire fence painting cost claimed to be 2½ cents per sq ft, posts and braces included.

Duro-Test Corporation, North Bergen, N. J., announces the Little Giant All-Weather **outdoor lamp,** 500-w, 4000-hr, R-40 lamp, reported resistant to temperature changes, moisture, dirt; applicable for yard lighting, gasoline stations, used car lots. . . . Brach Manufacturing Corp, 200 Central Ave, Newark, N. J., announces its type 2500 **terminal strip** with ten units molded in one piece. Each circuit can be opened for testing by a sliding link without disturbing connecting wires.

Beta Electric Corp, 333 East 103 St, New York 29, N. Y. announces their series 201-M portable **power supplies.** 0-30 kv dc, 2 ma, with load current meters. Power supply is 16x16x9 in and weighs 40 lb. . . . Super-Grip Anchor Bolt Co Inc, 3333 North 22 St, Philadelphia, Pa, announces single and double **anchor bolt assemblies** with a lead sleeve and a cup-shaped steel anchor; both elements can be inserted in masonry, brick or wood and are spread by repeated blows; sizes 3/16 to ½ in. and up to 5 in. long.

FITS EVERY LINEMAN!

NEW

Buckingham Adjustable Climbers

Now—one pair of climbers that fits tall men, short men—all men on the crew! One pair of climbers that accommodates the various thicknesses of footgear and clothing worn in different seasons!

New Buckingham Adjustable Climbers are quickly and easily adjusted from size 15" to size 18" by means of an oval head set screw and lock washer, assuring exact fit. If desired, leg irons can still be bent to follow the shape of the wearer's leg.

These advanced-design climbers permit utilities to carry a smaller stock of climbers. They are eminently practical as extra climbers. And—because they will fit any worker—they're ideal for sub-station, plant or service truck.

Famous Buckingham Quality, Safety, Comfort

Buckingham Adjustable Climbers can readily be fitted with leg and foot straps, and deluxe leather pads filled with rubberized wool for greater comfort. Gaffs are permanently attached to the leg irons, pitched at an angle which permits closer standing to the work—less chance of cut-out—easier climbing.

Standardize on Buckingham Adjustables. Fewer pairs are needed to keep every man working.

Ask about them at your supply house — or write for further information.

BUCKINGHAM MANUFACTURING CO., INC.
1-3 TRAVIS AVENUE BINGHAMTON, N. Y.

LETTERS TO THE EDITOR

Economy—Washington Style

To the Editor:

On Page 5 of the Aug. 4 issue, there is the following quotation:

"Congressional budget cuts to District of Columbia have dimmed the lights in downtown area of nation's capital. To save money district's commissioners ordered one lamp turned off in each of 330 twin-globe street lights."

While I sympathize with the need of economy when budgets are cut, the district commissioners are certainly taking a chance with human lives when they order a cut in lighting on the wide streets where the two-light standards are used. I, personally, know that those who have the responsibility for lighting Washington realize that these streets are greatly underlighted in comparison with the recommendations of the Illuminating Engineering Society and American Standards Association.

Instead of cutting the light in half, it should in many instances be increased several fold. There is much evidence to prove that such expenditures will be the wise investment. I presume the commissioners themselves would readily agree with this. Certainly they have taken some steps already which are very commendable in improving lighting on some of the heavy traffic streets.

Perhaps it would help if your magazine addressed an editorial to Congress urging that needed appropriations be made to make Washington streets an example of what can be done with traffic safety lighting. In fact, Washington should be known as our "City of Light."

A. F. Dickerson
General Manager
Lighting & Rectifier Department
General Electric Co
920 Western Avenue
West Lynn 3, Mass.

• Washington residents look on the action of the commissioners as more or less a method of dramatizing the budget cuts. They expect the commissioners to restore full lighting as soon as the nights grow longer.

Some Words of Praise

To the Editor:

I enjoyed reading the "The Light Bulb Talks" editorial in the Aug. 11 issue both from the point of view of the imaginative writing displayed and the basic soundness of the message.

Prejudiced? Who, me?

I was also struck by the fact that in the survey of home lighting practices (Pages 128-131), the smallest company reported using our light-sight teaching program had 15,000-plus residential meters, the largest one million plus. This indicated to me that both small and large school systems are willing to give their students the helpful information offered in these programs once the local electric company informs school authorities of their availability.

John H. Ronayne
National Better Light Better Sight Bureau
420 Lexington Ave.
New York 17, N. Y.

To the Editor:

Encomiums to you for the wonderfully good presentation in the Aug. 11 issue of Electrical World on utility activities in home lighting. I think it is the best presentation of its type I have ever seen, and I am particularly impressed with the art work—as well as the success you met with in really getting information from utility groups. It was a real thrill to see the story.

Mary E. Webber
Residential Lighting Specialist
General Electric Co
Cleveland 12, Ohio

To the Editor:

Congratulations on the fine job in the report of the survey of the 152 companies of home lighting promotion. This is the most complete coverage of the work being done by utilities that I have seen. You have made a fine contribution to the understanding of utilities about their home lighting problems and opportunities, and I for one want to thank you for this contribution.

H. A. Stroud
Promotion Manager
Monongahela Power Co
Fairmont, W. Va.

• Praise, we enjoy it.

Sub-Stations and Power Centers

for indoor installations

Engineered to meet your exact requirements

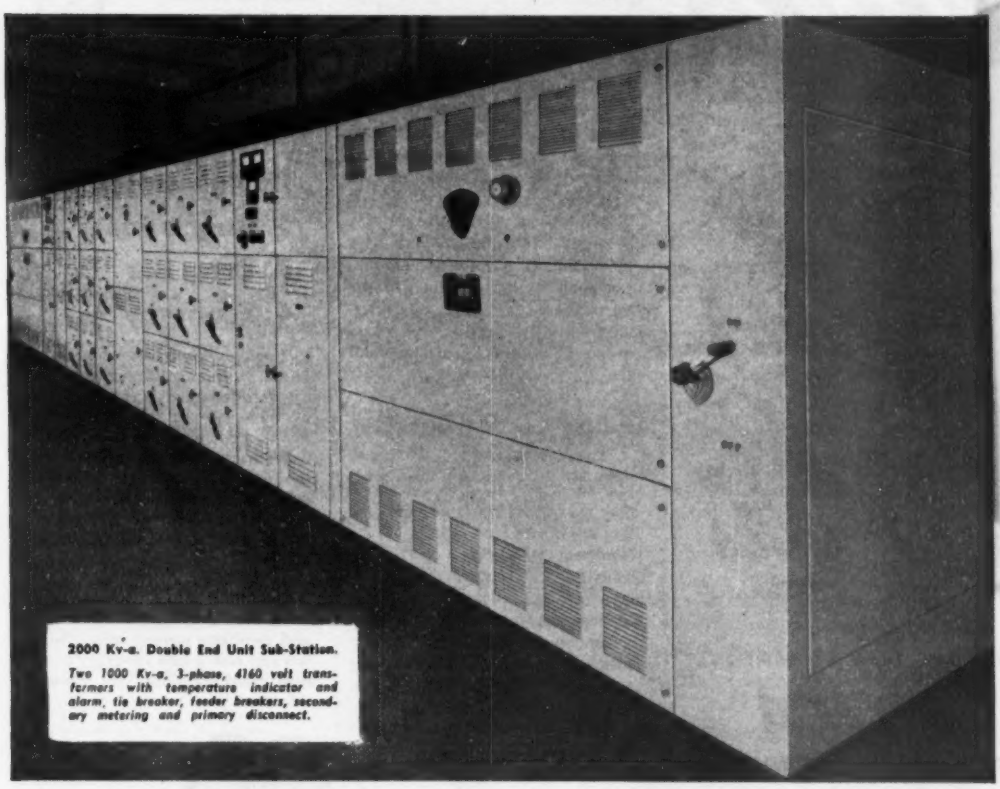
Not necessary to design or change your installation to fit a "standard"

Any type of primary switch gear.
Metering—primary or secondary, to suit.
Secondary breakers, main, branch, or tie.

Interlocked or automatic throw-over. Draw-out or stationary types. Magnetic trip, or thermal, or combination.

All incorporated with high quality, liberally designed **SORGEL** Air-Cooled Transformers.
All factory assembled, wired and tested. **Mounted on a substantial steel base.**
Shipped as a single unit or in sections, accurately co-ordinated for **easy assembly on the job.**

Sizes up to 2000 Kv-a. All voltages up to 15 KV.



2000 Kv-a. Double End Unit Sub-Station.
Two 1000 Kv-a, 3-phase, 4160 volt transformers with temperature indicator and alarm, tie breaker, feeder breakers, secondary metering and primary disconnect.

Also a Complete Line of Conventional Air-Cooled Dry-Type Transformers

¼ to 2000 Kv-a. Single phase and poly-phase. 120—240—480—600 volts.

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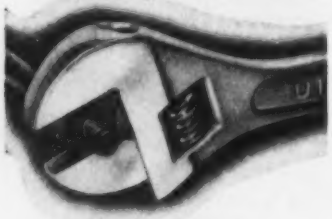
Pioneers in the development and manufacturing of Air-Cooled transformers

For ADJUSTABLE WRENCHES



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. . . the adjustable wrenches with the induction hardened jaw surfaces — *the wrenches that last up to 10 times longer*

ASK FOR THEM BY NAME . . .

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Available in 4", 6", 8", 10" and 12" sizes.

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DROP FORGE AND TOOL CORPORATION

IT PAYS TO BUY QUALITY TOOLS
and the world's best tools are made in U.S.A.

WHAT THEY'RE SAYING

At Industry Meetings

Hydro and Thermal Capacity

W. F. WYMAN, president, Central Maine Power Co, before the New York & New England Interagency Committee in Augusta, Maine.

In our forty four generating plants, about 65% of the generating capacity of 295,467 kw is now hydro and about 70% of our total output comes from this source. Sixty thousand kw in steam capacity and 45,000 more hydro are under way and an additional 30,000 kw in hydro has not yet been scheduled. We try at all times to maintain a proper balance between thermal and hydro but the thermal ratio will rise in the future.

If the 1951 tax treatment of TVA and its distributors ($5.17 per dollar of gross revenue) could have been accorded our company it would have cut our customer's bills by 21% without losing a penny of net earnings. It is hoped that the NENYIAC study will clearly refute the existence of a double standard as between the spending of public and private funds in the same business field. They both originate from the taxpayer but in one case the investment is voluntary and in the other, compulsory.

Statistical Quality Control

H. E. THOMPSON, quality control manager, Acaconda Wire & Cable Co, before the Sixth Annual Convention of the American Society for Quality Control at Syracuse, N. Y.

Our company has been operating a "quality minded" program for our employees that has resulted in large dollar savings ever since its innauguration. Whether you use statistical quality control or any other technique designed to improve quality, the whole thing can fail if the real desire to improve quality is missing.

Anaconda has set up its successful program to keep employees "quality minded" by establishing a continuous flow of information to them about the company, its policies and its problems. By means of supervisors, bulletin boards, displays, contests, letters to employees' homes, suggestion systems and "communication" methods, the firm has made employees "quality conscious".

Combines All Four

EVERY requisite that sound construction needs demand are combined in *Crapo* Galvanized Steel Strand—

1. High strength
2. Ruggedness
3. Long life
4. Economy

The superior tensile strength inherent in steel is utilized to fullest advantage in each size and grade of this time-proved strand. The heavy, ductile, tightly-adherent galvanized coating—applied by the famous *Crapo* process—provides dependable protection to the steel, extends the life of the strand beyond the normal period of replacement.

Specify *Crapo* Galvanized Steel Strand for guys, messenger and overhead ground wires! There is a size and grade for every practical need available for prompt shipment.

ASK YOUR JOBBER!

Consult your nearest distributor of *Crapo* Products or write direct for further information!

INDIANA STEEL & WIRE CO.

But more than that, the firm's quality standards must be clearly defined if improved quality by the employees is to be attained and maintained.

Threat of Socialism

KINSEY M. ROBINSON, president, Washington Water Power Co, before the National Conference of Electric and Gas Utility Accountants at New York.

You can't play make believe while a world force called socialism is eating its way toward you. Public relations needs a sort of balance wheel because the effect of government propaganda on utility public relations must never be underestimated. Specific items which amount to 105 million dollars are spent each year for direct propaganda purposes by the government. If the hidden costs were counted the figure might even rise to the one billion dollar mark.

The utility has various ways to win friends through the contact of company personnel and the public. The problems of the utility will never be understood unless we take upon ourselves the task of informing the public about them.

European Lighting

GEORGE A. FREEMAN, section engineer, Westinghouse Electric Corp, before a meeting of the Westinghouse Speakers Club at East Orange, N. J.

Fluorescent street lighting has gained great popularity in Europe with the best types found in Paris and London. This is apparently due to the fact that Europeans have not yet developed mercury street lighting and therefore there can not be a basis for a comparison.

Lamp bases and voltages in use in Europe differ greatly from types used in America, so that they have no opportunity to use or test American made lighting equipment.

Television Inventories Down

ROSS D. SIRAGUSA, president, Admiral Corp, before a distributor's meeting at Chicago, Ill.

The TV inventories of Admiral distributors are only one sixth as high as they were a year ago and are equal to less than one unit per dealer. Refrigerator inventories on the other hand are in excellent shape and distributors now have only one third of the units they had last year.

100 KVA Type F Transformer 2400/120/240

450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø— 120/208Y, 4 wire.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

1 to 2,000 KVA up to 15,000 Volts to meet individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

Made by a pioneer in the dry type, air-cooled transformer field. Eliminate need for liquid filled units. No hazardous, inflammable oil or toxic liquid to fuss with. Maintenance of oil level, foreign matter, sludge accumulation, and subsequent filtering are relegated to the "horse and buggy days".

MARCUS DRY TYPE, AIR-COOLED TRANSFORMERS

ARE SAFE — No explosion or fire hazards. No fire proof vaults. Class B and C heat proof insulations.

ARE ECONOMICAL — Lower cost installation and operation, negligible maintenance.

For the transformer that's second to none, specify MARCUS.

Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

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MARCUS
TRANSFORMER CO.
INC.
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PIONEERS IN THE FIELD OF AIR COOLED TRANSFORMERS

SAVE HOURS . . . SAVE DOLLARS!

WITH

PENGO *Triple Flight* ANCHOR AUGERS

***Especially designed to bore holes for* EXPANDING ANCHORS**

- ★ Double-helix cutting head eliminates back-thrust, quickly bores true and clean.
- ★ Triple-flight single helix carries bigger load of dirt from hole . . . you can complete a hole with less than half the trips down and up!
- ★ Extra-long auger with small-diameter center shaft leaves plenty of room for dirt and rocks . . . no clogging or jamming!

GET THE PENGO *"Wisdom Tooth"* IT KNOWS HOW TO BORE HOLES

- ★ Uses same fast-cutting replaceable PENGO Pilot Bits and PENGO Wisdom Teeth used on all PENGO Earth Augers and PENGO Cutting Heads.
- ★ Available in 9", 11" and 13" diameters for 8", 10" and 12" expanding anchors, respectively, to fit all popular makes of earth-boring machines.

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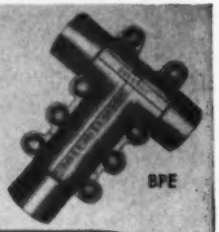
SANTA CLARA, CALIFORNIA

DOSSERT

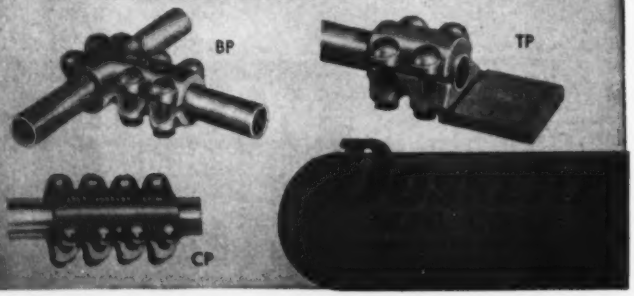
POWER CONNECTORS



FOR POWER TRANSMISSION AND SUBSTATIONS

Dossert Power Connectors are readily available in all combinations for tubular and flat bar bus, wire, and cable conductors . . . copper to copper, aluminum to aluminum, and aluminum to copper. All series of connectors also available with hex head bolts. Write for Catalog 45-1

Immediate delivery on all standard items.



The FCC under its new leadership is doing a magnificent job of thawing the freeze on new TV stations. Some 8000 sets were recently sold in the Denver area within two weeks after KFEL went on the air. By the end of this year a sale of 50,000 additional sets is expected. During the next five years throughout the United States some thirty million sets will be sold.

From now on Admiral will introduce only one new TV line a year. More than that only means waste for the factory and places a hardship on the dealers.

Cutting Handling Costs

BERTIL HANSON, manufacturing engineer, Westinghouse Electric Corp, before the Manufacturing Conference of the American Management Association at New York.

The recognition of the effect of material handling on product cost has brought out the need for a new approach to its reduction. Westinghouse has developed a "Material Handling Program" designed to systematically uncover and correct obsolete methods and conditions that hamper material handling. First through evaluating a plant's system as a whole and choosing the most fertile fields in which to attempt economies and second through an orderly work program to accomplish these economies.

Meeting the Manpower Shortage

R. A. KRAUSS, Cleveland Electric Illuminating Co, before the National Conference of Electric and Gas Utility Accountants at New York.

The manpower shortage in the utility industry today has not developed as was previously anticipated. However, the lag in defense production has created this condition. The plans and forecasts of government agencies indicate that what has been forecast for 1952 will eventually happen. Labor will be shifted to defense production thereby making our industry feel sharply the impact of a manpower shortage.

The utility electric industry should make a special effort in formulating plans for customers accounting activities. The manpower situation has been delayed but with the step-up of defense production it will become a reality to many of us in the very near future. Now is the time to make preparations to meet this crisis.

Where dependability counts, you'll find Dodge!

Public utility trucks must be ready to *go* . . . night or day, rain or shine, come hail or high water. More and more utilities, like Southern California Edison, are using Dodge *"Job-Rated"* trucks.

Dependability is a big red MUST with Dodge. You'll find it in such features as moistureproof ignition system, high-torque capacity starting motor, positive-pressure lubrication system.

You'll get long truck life, too, thanks to deep, broad-shouldered frames, shot-peened rear axle shafts, extra-long alloy steel springs, surface-hardened crankshaft journals on heavier models.

Power? Dodge *"Job-Rated"* trucks offer a wide range of engines, featuring 4-ring pistons with chrome-plated top rings, exhaust valve seat inserts, high compression ratio.

As for ease of handling, Dodge offers short wheelbase, cross-steering, wide front tread . . . all designed to get your trucks in and out of tight places quickly and easily.

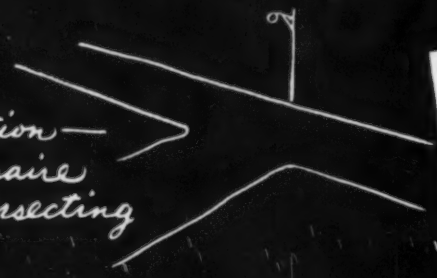
Drivers swear by Dodge, too. They like the chair-height seats, the greater visibility, the big positive brakes, the low ground-to-floor height for loading or unloading.

Your friendly Dodge dealer has a Dodge *"Job-Rated"* truck to meet your needs. Let him show you how Dodge gives greater dependability at low operating cost. See him today.

DODGE "Job-Rated" TRUCKS

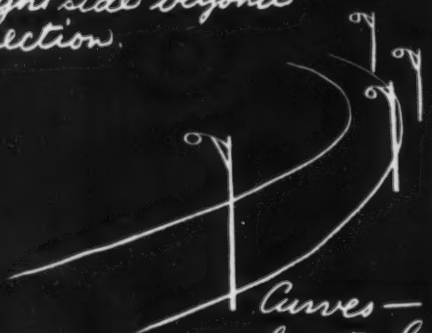
No. 3 in a series

PRACTICAL PROBLEMS TO CONSIDER IN STREET LIGHTING . . .



"T" Intersection — locate luminaire opposite intersecting street.

Right angle intersecting streets — locate luminaire on right side beyond intersection.



Curves — locate luminaires outside of curve

. . . . LIGHTING SPECIAL AREAS

As a rule, special areas present difficult problems and justify more detailed consideration since they are usually traffic hazards.

"T" intersections require more illumination than is specified for either of the intersecting streets. A luminaire should be located along the main street opposite the intersecting secondary street.

Intersections are an even greater hazard. Illumination should be *at least equal* to the sum required for the two intersecting streets. At right-angle intersections, where silhouette lighting is used, luminaires should be on the *right side* just beyond the intersection.

Curves require closer spacing than normal so that when an automobile is opposite any lamp, a straight line from the driver's eye to the next lamp should not intersect the radius edge of the pavement. Luminaires should be *on the outside* of the curve.

For practical engineering help in solving these and other street lighting problems, get the new "Street Lighting Engineering Guide," B-5460 . . . or ask for reprints of this series of advertisements. Consult with us at any time on any phase of a street-lighting problem. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-04311

Westinghouse OV-20, Mercury Vapor Luminaire, economically provides adequate illumination. Weatherproof and rugged to keep maintenance costs low.

YOU CAN BE SURE... IF IT'S

Westinghouse

LIGHTING DIVISION

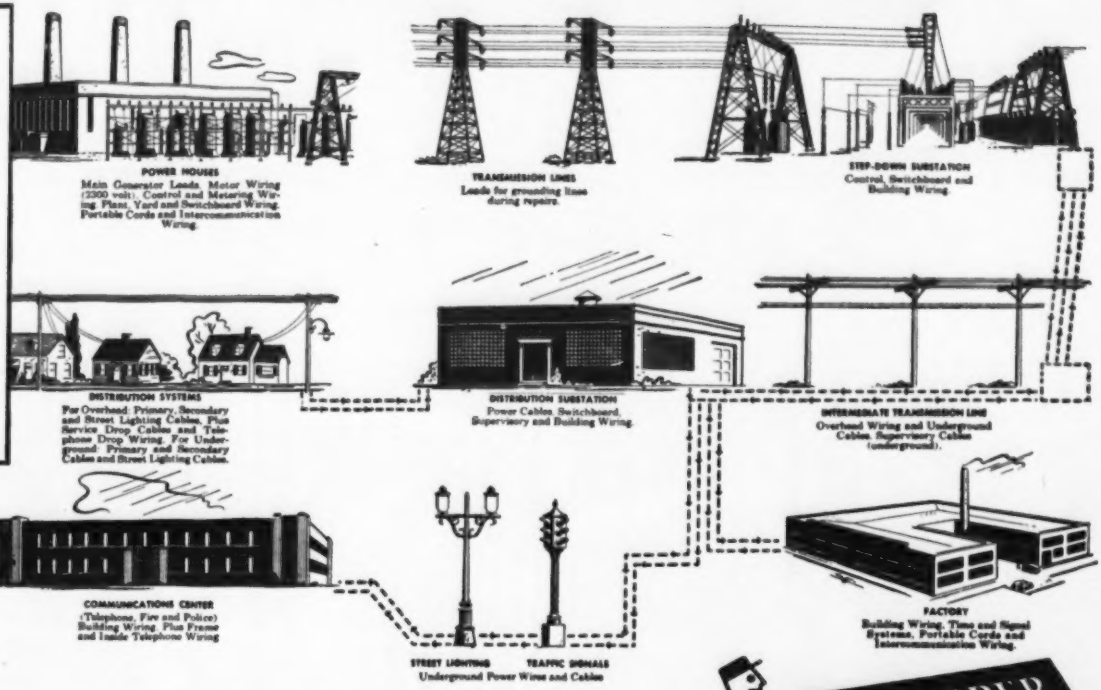
Edgewater Park, Cleveland, Ohio

You can solve any power puzzle

with U. S. Rubber Electrical Wires and Cables

For over 60 years United States Rubber Company has been manufacturing electrical wires and cables. Today, the range of these "U. S." products contains the answer to almost any wiring problem you may meet.

U. S. Rubber pioneered in developing Laytex® insulation made of 90% pure natural unmilled grainless rubber. From U. S. Royal Cables, Royal Master Portable Cords and Grizzly Underground Cables to Uskorona corona-resistant cable, the U. S. Rubber line includes utility wires and cables of every description, including cables fitted to IMSA specifications for traffic, fire and police needs.


POWER HOUSES
Main Generator Leads, Motor Wiring (2300 volt), Control and Metering Wiring, Plant, Yard and Switchboard Wiring, Portable Cords and Intercommunication Wiring.
TRANSMISSION LINES
Leads for grounding lines during repairs.
STEP-DOWN SUBSTATION
Control, Switchboard and Building Wiring.
DISTRIBUTION SYSTEMS
For Overhead, Primary, Secondary and Street Lighting Cables, Plus Service Drop Cables and Telephone Drop Wiring. For Underground, Primary and Secondary Cables and Street Lighting Cables.
DISTRIBUTION SUBSTATION
Power Cables, Switchboard, Supervisory and Building Wiring.
INTERMEDIATE TRANSMISSION LINE
Overhead Wiring and Underground Cables, Supervisory Cables (underground).
FIRE ALARM SYSTEMS
POLICE CALL SYSTEMS
Underground Communication Wires and Cables
COMMUNICATIONS CENTER
(Telephone, Fire and Police) Building Wiring, Plus Frame and Inside Telephone Wiring
STREET LIGHTING
TRAFFIC SIGNALS
Underground Power Wires and Cables
FACTORY
Building Wiring, Time and Signal Systems, Portable Cords and Intercommunication Wiring.

UNITED STATES RUBBER COMPANY

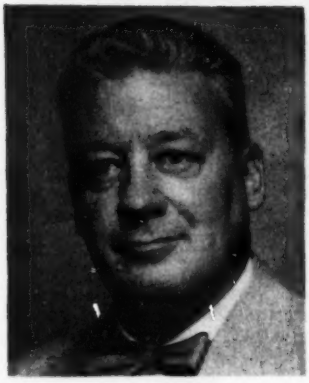
Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

U.S.RUBBER
SERVING THROUGH SCIENCE

NEWS ABOUT PEOPLE

George M. Pollard Advanced

Niagara Mohawk's operating engineer is made general superintendent of electric operations. Two others elevated



GEORGE M. POLLARD

Three appointments affecting the operating department of Niagara Mohawk Power Corp have been announced. George M. Pollard has been named general superintendent of all electric operations and Theodore C. Moran has been appointed general superintendent of all gas operations. John Y. Andrews has been made general supervisor of safety work. They will make their headquarters at Syracuse, N. Y.

Assumes New Duties . . . The utility also announced that Gustav F. Watters, a director and vice president, in addition to his present system-wide responsibilities as an executive staff officer, will assume the administrative functions of John L. Haley, vice president, who has retired. Haley, however will continue as a member of the board of directors.

Pollard, system operating engineer since 1950, joined Niagara Mohawk as an engineer in the steam plant design department at Buffalo in 1923, later transferring to the electrical design department. In 1929 he was named Buffalo district assistant superintendent of the substations department, becoming general superintendent of substations in 1936.

Four years later Pollard became superintendent of operations for the Buffalo district and in 1945 was appointed assistant operations manager for the Western Division.

Moran, who has been serving as system gas engineer, started with the system as a cadet engineer in 1924 at Syracuse. He was made an engineering assistant to the general superintendent of gas operations for the Syracuse district in 1926. In 1937 he was named assistant general superintendent of gas operations and ten years later was appointed general superintendent of gas operations for the utility's Central Division.

Active in Personnel Work . . . Andrews, system personnel representative, began his service with the system in 1931 as an inspector in the construction department and later transferred to the building maintenance department. In 1933 he assumed new duties in the personnel department and six years later was named assistant personnel manager. In 1943 he was named personnel manager for the Central Division and in 1951 was promoted to system personnel representative.

Watters, who began with the system in 1935 in the appliance service department at Buffalo, has been a director and vice president since 1950.

Haley's retirement concludes a career of 40 years in the electric and gas utility fields, of which thirty have been with Niagara Mohawk and its predecessor companies. In 1936 Haley came to Syracuse as a vice president of the Niagara Hudson Power Corp in charge of its Central Division. A year later he was elected president of Central New York Power Corp. When this firm was consolidated to form the Niagara Mohawk corporation in 1950, Haley was elected a director and administrative vice president in charge of the Central Division.

•

Thomas J. King has been named director of advertising and sales promotion for the Kelvinator Division of Nash-Kelvinator Corp, Detroit. For the past four years, King has been a publisher's representative in Detroit for the Crowell-Collier Publishing Co.

GORDON S. MEYRICK

Wisconsin PS Names Meyrick to New Post

Gordon S. Meyrick, acting chief engineer of Wisconsin Public Service Corp since 1951, has been appointed power and engineering manager. In his new post he will have the same authority and responsibility previously assumed by the chief engineer.

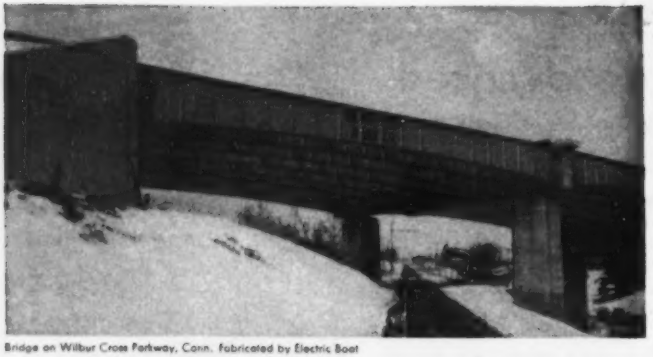
Meyrick graduated from University of Wisconsin's electrical engineering school in 1922 after serving for two years with the Navy during World War I. In 1923 he joined Wisconsin PS, becoming assistant chief engineer in 1942.

•

James C. Farling has been named superintendent of electrical equipment for the Northwestern Division of Pennsylvania Electric Co with headquarters at Erie. He will replace **George H. Cranston,** who is retiring Oct. 31 because of health reasons.

Roy N. Vernstrom, recently appointed executive assistant to Pres Paul B. McKee of Pacific Power & Light Co, has been assigned to the post of assistant general manager to supervise the company's Oregon operations outside Portland. He succeeds **D. B. Leonard,** who is being transferred to Yakima, Wash., to handle similar supervision over Pacific's operations in the state of Washington.

William C. Ayres has been made manager of materials for Hotpoint, Inc, Chicago, succeeding Albert H. Behnke, who has resigned. Ayres, for-



Bridge on Wilbur Cross Parkway, Conn. Fabricated by Electric Boat

STRUCTURAL STEEL WELDMENTS

Electric Boat now has available, for subcontract or jobbing work, extensive specialized facilities for fabricating and welding structural steel sections for bridges, power line towers, etc. Our long and successful experience in this field is your assurance of high-precision craftsmanship and on-time deliveries. We will gladly give full information on request.

Address inquiries to:

ELECTRIC BOAT

Division of General Dynamics Corporation

Groton, Connecticut

merly administrative assistant of the materials department, joined Hotpoint in 1947.

Bradford J. Stimpson has been made application engineer for Pacific Electric Manufacturing Corp at Seattle, where he will assist Charles H. Cutter, the firm's Northwest manager. Stimpson has spent the last five years in the Circuit-Breaker Sales Division at the company's San Francisco factory.

John H. Thomas, formerly manager of the Homewood Manufacturing and Repair plant of Westinghouse Electric Corp at Pittsburgh, has been named manager of manufacturing at the firm's East Springfield (Mass.) plant. He joined Westinghouse in 1922.

A. W. Fraps has been made central station sales manager for Roller-Smith Corp, Bethlehem, Pa. Prior to this appointment he was an engineering consultant in South Bend, Ind.

Reynolds S. Smith, Jr, has been appointed to the newly created post of assistant to the president of Unistrut Products Co, Chicago.

J. P. Graham has been made manager of Arkansas Power & Light Co's Elaine office. He has been with the utility since 1941.

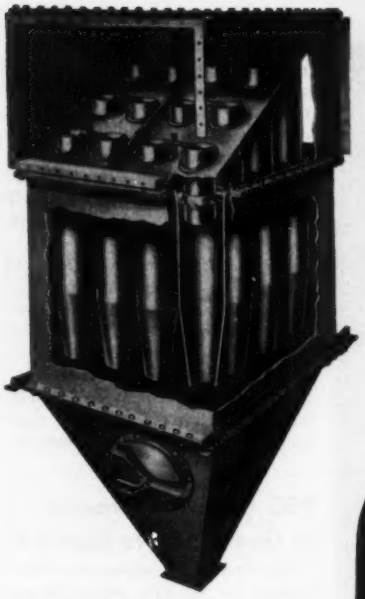
OBITUARY

Edward A. Brewer, 69, board chairman and former president of Brewer-Titchener Corp, Cortland, N. Y., died Aug. 22. Brewer, associated with the firm's manufacturing operations first as president and later as chairman of the board for the past 30 years, retired from the presidency December, 1951.

Hugh J. Fraser, 54, vice president in general charge of all plant operations in the U. S. for International Nickel Co. Inc, died Aug. 22 at Montreal, Can. Fraser, who joined the Huntington (W. Va.) Works of International Nickel in 1923, had filled the vice president's post since 1947. He was also an assistant vice president of the parent organization, International Nickel Co of Canada, Ltd. since 1943.

Ernest S. Rafuse, 53, chief engineer of the Massachusetts Department of Public Utilities, died at Chelsea, Mass., Aug. 26. After 18 years' service with the commission, he was named to the engineer's post in 1951.

3 Advantages!
* LOW COST
* Makes High Pressure Connection
* Neat, Compact and Easy to Tape
UL
BLACKBURN
Hi-Strength
TWO-BOLT CLAMP
Jasper Blackburn Corporation
Ideal for taps, other connections, and dead-end snubbing on cables from 1/0 to 1,000,000 CM. Heavy, sturdy construction, yet compact and easy to tape. Produces very tight, high-pressure, trouble-free connections. For the best in quality at low cost, specify BLACKBURN.



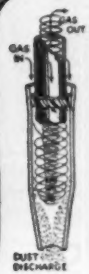
In dust and fly ash recovery

MULTICLONE COLLECTORS

and only Multiclones give vital advantages like these...

No wonder "MULTICLONE" is the leading name in the centrifugal recovery of dust and fly ash from all types of gases, hot or cold.

No other mechanical recovery equipment has so many years of dust and fly ash recovery experience behind it... or has such uniformly high collecting efficiency... or provides so many other money-saving, space-saving advantages as MULTICLONE. The four advantages outlined below are by no means the complete MULTICLONE story, but are typical of the vital savings found *exclusively* in MULTICLONE equipment...



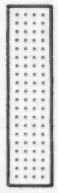
Uniformly High Recovery:

MULTICLONE's multiple *small diameter* tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles, but also a high percentage of the *extremely small* particles of 10 microns and less. This, coupled with the fact that there are no pads or filters to become choked with recovered material, results in a more complete recovery of *all* suspended materials from the gas stream.

Space-Saving Compactness:

Plant space costs money—so be sure to check space requirements carefully. As shown in the accompanying chart, the MULTICLONE requires less floor space and less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the great importance of this one MULTICLONE advantage alone!

Make	Relative Space Requirements in Sq. Ft.	in Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9



Long and narrow

Square

Maximum Adaptability:

In addition to its unusual compactness, the MULTICLONE is also unusually adaptable to various installation requirements. Where head room is low it can be installed with side-inlet side-outlet connections. Where side clearances are restricted, it can be installed with side-inlet top-outlet connections. In addition, without changing capacities, the shape of the unit can be varied—long and narrow, short and wide, or square—to fit restricted spaces ... and its single-inlet single-outlet duct requirements permit greater flexibility and simpler installation. These savings slice installation costs, space requirements and insulating expense.

Minimum Maintenance:

The MULTICLONE has no high speed moving parts to repair or replace... no pads or filters to clean or renew... nothing to choke the gas flow or increase draft losses as suspended materials are recovered. MULTICLONE draft losses remain uniformly low *at all times*. Further, the recovered material from an entire bank of tubes is collected in a *single* hopper—far easier to service and maintain than the multiple hoppers of conventional cyclone units.

FREE INFORMATIVE BOOKLET
This 32 page booklet outlines the basic principles of centrifugal dust recovery and shows the many ways MULTICLONE advantages assure higher recovery at lower overall costs. A free copy of this booklet will gladly be sent on request. Write today!

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MANUFACTURERS & MARKETS

PARTIALLY COMPLETED COND-AL windings of a rotor for a 216,000-kva generator are inspected by C. H. Holley (left) and H. D. Taylor, General Electric engineers. Unit is first of four turbine-generators which GE claims will be largest 3,600-rmp machines built to date

GE's New Aluminum Alloy . . .

. . . makes possible production of larger, more powerful generators. Known as Cond-Al, material is lighter than copper

General Electric Co has announced the development of an aluminum alloy called Cond-Al, which has enabled the company to launch production of four 216,000-kva, 3,600-rpm steam turbine-generators. The units, it was reported, will be larger and more powerful than any previously manufactured by GE.

Superior Material . . . In announcing the sucessful outcome of metallurgical research started in 1944, Glenn B. Warren, general manager of GE's Turbine Division, has described the alloy as a superior material for winding high-speed, large-diameter generator rotors.

Use of Cond-A1 is one way to remove previous limitations imposed by use of conventional winding materials upon the size of 3,600-rpm generator fields. Warren also disclosed that units with capabilities of 300,000 kva and larger are now being developed at Schenectady.

Cond-A1, whose name is a contraction of the words "conductivity aluminum," is composed of 99.15% aluminum, .45% iron, .3% magnesium, and .1% silicon. It is considered ideal for its present application because of its light weight, high conductivity, creep strength, and thermal stability.

High Conductivity . . . The new alloy has electrical conductivity of 59% of standard copper, compared with 61% for EC grade aluminum. At 25 C (room temperature) it has more than four times the compressive yield strength of EC grade aluminum. At temperature of 140 C (285 F) its compression creep is less than one-fiftieth of that of EC grade aluminum at moderate stress and still less, relatively, for higher stresses. Cond-A1's fatigue strength is about the same as that of cold-worked, silver-bearing copper.

Cond-Al is being made for GE by Aluminum Co of America.

1st Unit On Way . . . Construction of the first four turbine-generators using the new alloy is under way at the company's turbine plant at Schenectady. The first unit is scheduled for completion this fall.

When assembled the 216,000-kva units will each weigh more than 700 tons and will be nearly 82 ft long, 17 ft wide, and more than 10 ft high above floor level.

Because of railroad clearance and weight limitations, the generator stator of each of the units will be too massive for shipment intact. To cope with the situation, a method of double-frame construction was adopted for the project. Inner and outer stator frames are being built with the outer frame to be shipped in three sections.

PSC Orders Milwaukee to Give Water to Square D

The City of Milwaukee has been directed by the state Public Service Commission to supply water to Square D Co's new plant.

The plant, a one-story, 240-ft long building, is located partly in the city of Milwaukee and partly in the city of Glendale. Milwaukee had agreed to provide water only to that portion of the building situated in the city.

Square D officials and the city of Glendale last February filed a complaint with the commission in Madison. After a hearing, the commission found that Milwaukee already was providing water to the area directly around the plant site.

Company officials revealed that it would cost $70,000 to develop a deep well to supply the Glendale part of the plant with its requirement of 15 gallons a minute.

MANUFACTURING BRIEFS

To build up the potential production of Westinghouse Electric Corp's Lamp Division plant at Fairmont, W. Va., all manufacturing of tubular fluorescent lamps has been concentrated there. Production has been increased by bringing machinery from the Bloomfield, N. J. headquarters of the division to Fairmont.

Philco Corp's Government and Industrial Division has established its headquarters at a new address. The

new offices are at 4700 Wissahickon Ave., Philadelphia.

General Electric Co's Small Appliance Division has created a special fair trade section to enforce state fair trade laws on the sale of all its products.

SALES ASSIGNMENTS

COMPANY STAFFS

Libbey-Owens-Ford Glass Co has named Arthur S. White field representative in the Kansas City area for its Fiber Glass Division. White, recently associated with architectural and engineering work, will make his headquarters in the Dwight Bldg., 1004 Baltimore St., Kansas City, Mo.

Allis-Chalmers Manufacturing Co, Milwaukee, has announced the following sales-representative appointments in its General Machinery Division's district offices: Arthur H. Roth, New York; Wesley G. Hurst, Davenport, Iowa; George E. Johnson, Chicago; Richard H. Nicholson, San Francisco; Edward H. Blakestad, Tulsa; and George M. Fullwood, Dallas. W. Ellis Rosser has been appointed a service representative in the Chicago office.

Kaiser Aluminum & Chemical Sales, Inc, has named Richard E. Hanson, formerly manager of the firm's Kansas City (Mo.) district office, assistant to John E. Menz, general sales manager in the Chicago general sales office. Wallace A. Davidson is the new manager in Kansas City and Donald F. Sheridan has been appointed head of the Wichita (Kan.) office, a branch sales outlet under the company's Kansas City headquarters.

Leader Electric Co, Chicago, manufacturer of fluorescent lighting fixtures has named Mel Knox as its direct factory representative of the Washington area. He will be located at 229 Bond Bldg., Washington, D. C.

Minneapolis-Honeywell Regulator Co has made J. M. Douglas valve sales manager for the central region. He will make his headquarters at the company's Cleveland branch office.

General Electric Co has transferred T. A. Saunders to the industrial department staff of the apparatus sales office in San Francisco. Previously Saunders worked in the industrial department in GE's Chicago office.

REPRESENTATIVES

Eagle Electric Manufacturing Co, Inc, Long Island City, N. Y., has appointed Brill Electric Sales as the Eagle representative in the San Francisco area. Brill, located at 446 Bryant St. San Francisco, will cover central and north California and Nevada.

Buchanan Electrical Products Corp, Hillside, N. J., has assigned Walter Clinton and his affiliate Hartwell Jalonick, who have for several years represented Buchanan in Texas and Oklahoma, to cover Arkansas and Louisiana, too. For the time being Clinton will continue to operate with headquarters at Houston with Jalonick in charge of branch headquarters at Dallas.

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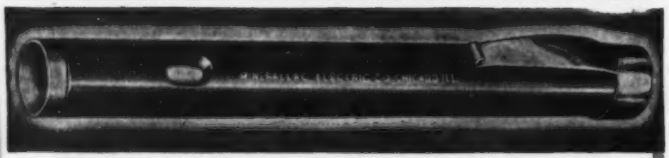

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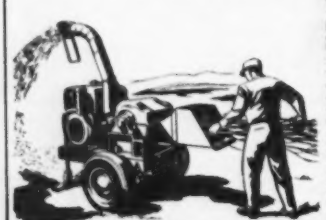

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New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES
Proposed Construction

Ala., Fort McClellan—U. S. Eng., P. O. Box 1169, Mobile, 7, Ala. modification and addition to electrical distr. sys., near Anniston, Eng 01-06-52-14. Plans deposit $5.

Ark., Pine Bluff—Central Transformer Corp., c/o Ginocchio-Cromwell & Assocs., archt., Hall Bldg., Little Rock, plant. Over $150,000.

California—Bureau Reclamation, Dpt. Interior Bldg., 53 Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Sacramento, circuit breakers, potential device complete for Folsom-Elverta Terminal Switching Facilities, Central Valley Proj., Spec. DS-3776. J. N. McClellan, ch. engr.

Colo., Denver—Civil Aeronautics Admin., City Hall, Kansas City, Mo., remote transmitter at Stapleton Airfield.

Conn., Montville—Connecticut Light & Power Co., 250 Freight St., Waterbury, power plant addns. $16,000,000. United Engineers & Constructors, Inc., 1401 Arch St., Phila., Pa., consult. engr.

Idaho—U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash., main auxiliary power board for 440-volt service at Albeni Falls Dam, Inv. 53-10; 15-kv. indoor metal-clad switchgear, generator bus housing, etc. for Albeni Falls Powerhouse, Inv. 53-9.

Illinois—Eastern Illinois Power Cooperative, Paxton, 57 mi. rural distr. line and sys. imprvs., Iroquois Co. $432,000.

Ill., Normal—State, Springfield, general work, piping, insulation, boilers, burners, fuel oil storage tank, electrical, electrical underground distr. sys. for rehabilitation and expansion of power plant at Illinois Soldiers' and Sailors Children's School, $396,030.

Ill., Rantoul—U. S. Eng., 475 Merchandise Mart, Chicago, Zone 54, 69 kv substation, Chanute Air Force Base, Serial No. ENG 11-032-53-7.

Indiana and Ohio—Ohio Valley Power Corp., (combination fifteen companies) Portsmouth, O. The companies who may make up the combination are:

Ohio Power Co., Indiana and Michigan Electric Co. and the Appalachian Electric & Power Co., (subsidiaries of American Gas & Electric Service Corp.), 30 Church St., New York, N. Y.

Monongahela Power Co.; The Potomac Edison Co. and West Penn Power Co. (subsidiaries of West Penn Electric Co.), 50 Broad St., New York.

Cincinnati Gas & Electric Co., 4 and Main Sts., Cincinnati, O.

Kentucky Utilities Co., 159 West Main St., Lexington, Ky.

Louisville Gas & Electric Co., 311 W. Chestnut St., Louisville, Ky.

Ohio Edison Co., 47 N. Main St., Akron, O.

Dayton Power & Light Co., 25 N. Main St., Dayton, O.

Southern Indiana Gas & Electric Co., 20 N. W. 4 St., Evansville, Ind.

Toledo Edison Co., Edison Bldg., Toledo, O.

Columbus & Southern Electric Co., 215 N. Front St., Columbus, O.

Pennsylvania Power Co., (subsidiary Ohio Edison), 19 E. Washington St., Newcastle, Pa.; plans to construct two power plants at sites not selected in Ohio and West Virginia to supply power to Atomic Energy Commission's uranium plant at Piketon, O. incl.; 1,200,000 kw generating plant near Ohio-Kentucky border, $280,000,000; Ebasco Services, Inc., 2 Rector St., New York, N. Y. CA Approx. $120,000,000. 800,000 kw generating plant, with four 200,000 kw. Steam generating units, near Portsmouth, Ohio.

Iowa—Iowa Public Service Co., Orpheum-Electric Bldg., Sioux City, 127 mi. 161 kv. transmission line from Hinton to Fort Dodge, via Storm Lake with sub-sta-

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tions at Hinton and Storm Lake and switching station at Fort Dodge. $4,225,000. H. H. Huevelman, c/o owner, ch. engr.

Nebraska—McCook Public Power Dist., McCook, 228.9 mi. rural distr. lines, Lincoln, Hayes, Frontier, Red Willow and Hitchcock Counties. $250,000. P. L. Burns, Davenport Bank Bldg., Davenport, Ia., consult. engr.

Okla., Yukon—Oklahoma Gas & Electric Co., 315 N. Harvey St., Oklahoma City, 100,000 kw generator unit to be installed in Mustang power plant. $10,000,000. Leo Lash, c/o owner, engr.

South Dakota — Bureau Reclamation, Dpt. Interior, Huran, 55 mi. wood-pole, H-frame type, 115-k, 3-phase, single-circuit transmission line, for Missouri River Basin, Proj., Spec. No. DC-3781.

Tennessee—U. S. Eng., 303 Federal Office Bldg., Nashville, Zone 1, design, manufacture and del. three 20,000 h.p. hydraulic turbines for Cheatham Hydro-electric power plant, at Mile 148.7 on Cumberland River, approx. 23 mi. upstream from city of Clarksville, Serial No. CIVENG 40-058-53-5.

Tex., Calallen—General Power & Light Co., 120 N. Chapparral St., Corpus Christi, Lon C. Hill Power Station, 66,600-kw. $5,500,000. Sargent & Lundy, 140 S. Dearborn St., Chicago 3, Ill., consult. engrs.

Tex., Lone Star—Southwestern Gas & Electric Co., c/o Frank M. Wilkes, Marshall, 40,000 kw. electric power generating plant unit. $3,500,000.

Virginia—U. S. Eng., foot of Front St., Norfolk, completing John H. Kerr Reservoir (Buggs Island Dam) on Roanoke River, Incl. power house and installing 6 generating units. $6,840,000.

Washington—Bonneville Power Admin., P. O. Box 3621 Portland, Ore., transmission line from Olympia to Aberdeen. $1,300,000.

Wisconsin—Waushara County Electric Co-operative, Wautoma, 123 mi. rural distr. lines and sys. imprvs., Waushara Co. $293,000.

Alaska—Aluminum Co. of America, 2156 Gulf Bldg., Pittsburgh 19, Pa., plans aluminum plant, including smelting plant, 2 power plants, 13 mi. power tunnel, transportation facilities, and community development, with housing, schools, churches, store near Skagway, Taiya Valley District. $400,000,000.

Low Bidders & Contracts Awarded

Fla., Jacksonville—Babcock & Wilcox Co., 161 E. 42 St., New York, N. Y., CA. $2,716,036, furnishing, installing three 40,000 kva electric generators for Talleyrand and Southside plants for expansion. City, City Hall, Jacksonville, Fla. Awarded July 30.

S. D., Watertown—General Electric Co., Plymouth Bldg., Minneapolis, Minn., CA. $64,076, 12.5 KV switchgear; Allis-Chalmers Mfg. Co., Foshay Tower, Minneapolis, Minn., CA $80,503, two 7,500 KVA transformers for Municipal power plant. City, P. Krakowski, aud., Watertown, S. D. R. D. Thomas & Assoc., 400 Metropolitan Life Bldg., Minneapolis, Minn., engrs. Bids Aug. 4.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Calif., Van Nuys—Joseph I. Schlitz Brewing Co., 235 W. Galena St., Milwaukee, Wis., plans by Harley, Ellington & Day, 153 E. Elizabeth St., Detroit, Mich., brewery. $20,000,000. Brandow & Johnston, 501 S. Boylston St., Los Angeles, consult. engrs.

Missouri or Illinois—Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo., plant and facilities for mfg. of cortisone, either adjacent to 1700 S. Second St., St. Louis, Mo. or near its plant at Monsanto, Ill., $18,415,000.

Tenn., Memphis—W. R. Grace & Co., 7 Hanover Square, New York, N. Y., anhydrous ammonia plant, $15,000,000.

Tex., Karnack—U. S. Eng., 100 W. Vickery St., Fort Worth, ordnance plant project, at Longhorn Ordnance Works, $30,000,000. Thiokol, 780 N. Clinton Ave., Trenton, N. J., and R. W. Booker & Assoc., 1722 Olive St., St. Louis, Mo., engrs.-archts.

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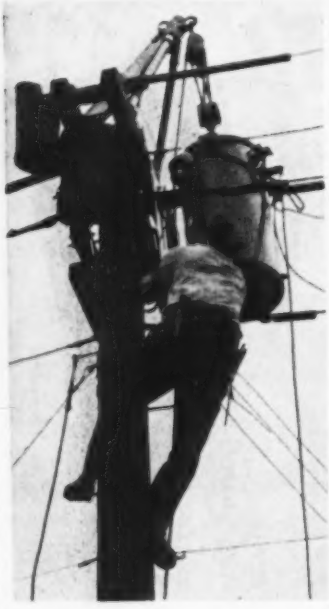

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BOOK REVIEWS

Power Equipment

Starkstromtechnik. By E. V. Rziha. Published by Wilhelm Ernst & Son, 169 Hohenzollerndamm, Berlin-Wilmersdorf. 2 vols. 620 pages. Price 24 DM.

This book is the eighth revision of a standard German text dealing with the fundamentals of dc machines, asynchronous and synchronous machines, ac commutator machines and transformers.

Circuits and Machines

Electric Circuits and Machines. By Eugene C. Lister, Second Edition, Published by McGraw-Hill Book Co, New York 36. 427 pages, illustrated. Price $5.50

The original text was assembled as a concise outline text for a brief course in electric circuits and machines at Iowa State College. First edition published in 1945. The second edition includes new section in chapter on Feeder Voltage Regulators and an entire new chapter "Circuit Protective and Switching Equipment." Also included in this second edition is a brief discussion on complex quantities notation for vector representation in the appendix.

AC Armature Windings

Alternate Current Armature Winding. By Charles S. Siskind. Published by McGraw-Hill Book Co, New York 36. 236 pages, illustrated. Price $5.00

This is a companion volume to "Direct-Current Armature Windings." Virtually every kind of modern ac machine is covered in this new text which emphasizes the principles underlying various windings, their construction and practical application. Simple coil and winding procedures are gradually evolved into more complex arrangements. Single and polyphase windings get separate special treatment. Typical windings are worked out and their construction and design discussed. Single-phase windings - spiral, concentric and skein types come first in connection with repulsion and split-phase motors. The next items that are discussed are concentric-chain polyphase windings and three polyphase wave and lap windings. Multispeed single and polyphase motor windings are handled in detail and in a manner that is easily understood.

Engineering Mathematics

Advanced Engineering Mathematics. By C. R. Wylie, Jr. Published by McGraw-Hill Book Co, New York 36. 640 pages, illustrated. Price $7.50

This book on advanced engineering mathematics is definitely not light reading. On the other hand it is about as easy a text as an engineer could hope for who is bent on going beyond undergraduate calculus to keep abreast of developments. A more than ordinarily generous number of examples supplements a lucid text in making it possible to use the book for study with little need for outside help. Subject matter covers ordinary differential equations, fourier series, operational calculus and the Laplace transformation, separable partial differential equations, functions of a complex variable, victor analysis. However, although there is a long chapter on numerical methods the author chose to omit statistics, quality control, or nomography. Bessel functions are discussed but not Legendre polynomials.

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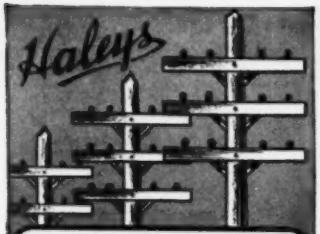

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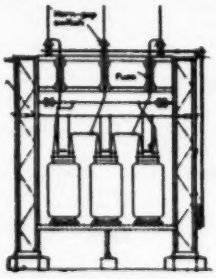

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Electrical Reference

Electrical Reference. **By E. S. Lincoln. Published by The Electrical Modernization Bureau Inc, New York 17. Over 1750 pages, illustrated. Price $25.00**

This volume is the Second Edition of Electrical Reference (listed 1941), and the number of pages has now been increased by almost fifty percent. Each of the 26 sections presents basic facts, data, and up-to-date information on industrial and commercial electrical equipment. Also pertinent material from the ASA and NEMA standards and the National Electrical Code are included which applies to the particular equipments. Indexes are provided at the beginning of each section. The book should be helpful to management, electrical design, operating and maintenance engineers, electrical contractors, electrical engineering instructors and students.

Power Systems

Power System Analyses. **By J. R. Mortlock and M. W. Humphrey Davis. Published by Chapman & Hall, 37 Essex St, London. 384 pages. Price 45 shillings ($6.30)**

With some notable additions this book comprises the notes and discussions growing out of a post graduate course in system analysis given at the Imperial College in London for power system engineers, researchers and teachers. This work is chiefly preoccupied with the application of steady state network theory to power system engineering. It is by prevailing standards not a difficult book. It offers the utility engineer seeking a working understanding of system analyses a lucid introduction to the subject. Opening chapters offer gradual indoctrination in nomenclature and symbols in ac circuits, solution of simple networks and the method of symmetrical components before tackling power system control, system stability and matrex solution of power networks. There is a fine chapter on network analyzers but there is only one chapter on system design. One wishes there could have been more on this subject.

Power Metering

Electricity Meters and Instrument Transformers. **By S. James. Published by Chapman & Hall, London WC 2. 458 pages, illustrated. Price 50 s.**

A manufacturer's engineer tells how the producers view their product as tools for the metering art. He thus goes more penetratively into factors which most of the power-system authors have minimized by comparison. Mechanisms are dominantly British but the principles are essentially identical with U.S.A. forms. A considerable chapter is devoted to prepayment meters and another chapter to kva metering, both relatively uncommon here in the United States.

Energy

Energy Retrospect. **By J. H. M. Sykes. Published by Garraway, Ltd., London WI. 46 pages. Price 6s 6d.**

Britain is nearer to exhaustion of coal than U.S.A. and therefore nearer to realization that a long-term plan of conservative utilization is desirable. In this little book we of today are the grandfathers of the electrical economists of 1999. They look back debatively on our tactics and conclude that to continue burning coal was criminal either in house heaters or power plants, and that the soun answer was to accelerate atomic, tidal and wind sources while cultivating and interconnecting hydro to fullest extent. That preserves the shrinking coal for chemical processing.

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CATALOGS · BULLETINS

● POWER FREQUENCY AMPLIFIER: A bulletin that illustrates the model 105 Meter Matcher has been made available by Keithley Instruments, 3868 Carnegie Ave, Cleveland 15, Ohio. It describes their amplifier which allows measurements to be made without loading the test circuit. Write the company for information.

● COMPRESSORS: Interested persons may write the Davey Compressor Co, Kent, Ohio, for their new Form E-237, a booklet which describes their line of 185 cfm compressors. Complete mechanical specifications are included in this 4 pg bulletin.

● WELDING ANALYZER: The Brush Development Co, 3405 Perkins Ave, Cleveland 14, Ohio, has made available a catalog showing their new Welding Analyzer, Model BL-218. The catalog, attainable on request, describes the equipment and its uses and supplies complete specifications.

● STANDARD DIE CATALOG: To facilitate ordering standard punches and dies for presses, the Federal Machinery Co, 134 Grand St, New York 13, N. Y., is now offering a catalog of diagrams, charts and tables of typical machinery and equipment. It is illustrated, includes prices and may be had by writing to the Sales Department.

● UNIFIED THREAD MANUAL: Besly-Welles Corp, Beloit, Wis, has made available upon request a tap manual for British-American Unified Thread. The bulletin also contains information on tap-drill sizes, feeds, speeds, sharpening taps, types of coolants and screw thread terms and definitions. Write the company for copies.

● POWER-IRON CORES: Characteristics of commonly used powders and typical performance data for pat core assemblies, as well as cataloging of timing, plain and cup cores, are included in Lenkurt Bulletin IC-p8. Write Lenkurt Electric Co, 1108 Country Road, San Carlos, Calif.

● WELDING: The new issue of Arc Welding News, containing the latest information about diverse welding applications, is now available. This 16 pg brochure includes photographs and free copies may be had from the Hobart Brothers Co, Troy, Ohio

● MICROWAVES: Three new bulletins by RCA describe completely what microwave communication is, what it does and the RCA aerial survey service for laying out a microwave system. Information is furnished about existing microwave links, with the overall microwave picture clearly presented. Copies may be obtained by writing Communications Section, Radio Corporation of America, Engineering Products Dept, Camden, N. J.

● HAND TACHOMETERS: Bulletin 12AA has recently been released by the Associated Research Inc, 3758 W Belmont Ave, Chicago, Ill. This bulletin gives data on 1 to 5 range mechanical hand tachometers and single range chronometric speed indicators. It may be obtained by writing the company.

● TV ANTENNA SYSTEMS: Catalogs 38 and 39 from the Technical Appliance Corp, Sherburne, N. Y., describe 80 antennas and antenna systems. It also lists their accessory and hardware line plus a section devoted to a preview of VHF antennas. Copies are now available.

● CARRIER SYSTEM: A bulletin illustrating the type 33C carrier telephone system is now being distributed by the Lenkurt Electric Co, San Carlos, Calif. Ask for bulletin 33C-P4. This 8 pg 2 color bulletin is available upon request from the company.

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TECHNICAL LITERATURE

Cigre Conference Abstracts—Abstracts of 40 selected technical papers presented at the International Conference on Large Electric High-Tension Systems (CIGRE) held in Paris, May 28-June 7 are available in mimeograph form. Prepared by the editors of Electrical World. These abstracts summarize briefly the subject matter of papers in the fields of transmission, circuit interruption, generation and systems. Write to Electrical World, Editorial Department, 330 W 42 Street, New York 36, N. Y.

Electrical Equipment—The following bulletins, new and revised, have been issued by the Berkshire Laboratories, 528 Beaver Pond Rd, Lincoln, Mass. Bulletin B-1A is on the Labmaker, used for timing purposes in cathode ray oscillography. Bulletin B-18A on 60 cycle stroboscope and B-44 on the metals tester for ferrous and non-ferrous metal. Copies will be supplied to those interested on request.

Proceedings — *"Strengthening America Through Standards"* is the title of the 64 pg book just published, containing the 21 addresses given at the Second Material Standardization Conference held in New York. Transcriptions of several question and answer discussion periods are also reprinted. The booklet is being sold by the American Standards Assoc, 70 E 45th St, New York 17, N. Y. for $1 a copy.

Gear Chucks—The Garrison Machine Works Inc Dayton 4, Ohio has issued its latest catalog on custom-built gear chucks. It contains photos, descriptions and applications of their precision tools. For details about this 8 pg 2-color folder write the company.

Surveying, Mapping and Related Engineering—The Tennessee Valley Authority announced recently publication of its Technical Report No 22 which covers their experience in this specialized engineering field. Such features as control and adjustment of surveys, planemetric and topographic surveying and mapping utility relations and military mapping are included. This $2.25 manual may be obtained from the TVA Treasurers Office, Knoxville, Tennessee.

NEMA Standards—The following standards have just been published by Nema Standards, Publication No LA1-1952 to LA5-1952, for lightning arresters. It contains all of the standards which have been approved. The latest NEMA standards for electrical mica are included in publication No ME 1-1952. The former is priced at $2.50 and the latter at $1.50 per copy and may be obtained from the National Electric Manufacturers Association 155 East 44th St, New York 17, N. Y.

Lighting—The Holophane Co Inc, 342 Madison Ave, New York 17, N. Y. has published a new 96 pg information handbook dealing with industrial lighting. It contains general engineering data on principle and economies plus a listing of specific industrial areas. Problems are explained in terms of fundamental principles, actual equipment needed and most advantageous applications. This manual may be had by writing to the company.

Nema Standards—The following standards have recently been published by the National Electric Manufacturers Assoc, 155 E 44 St New York 17, N. Y. and copies are available. *Nema Standards for Electric Power Connectors, Publication No 561-1952. Nema Standards for Color Workings for Electrode Identification, Publication No 5613-1952* and *Nema ards for Automatic Circuit Reclosers Publicaltion No 5613-1952* and *Nema Standards for Distribution Fuse Links, Publication No 108-1952.* Copies are ready for distribution at 15 cents each.

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TURBO GENERATORS

Qu	KW	Make	Desc.
1	6000	Al. Ch.	Condensing 200/250 I.S.P. 2300 v 3/60 Exc & Surf cs Cond.
1	750	G.E.	Condensing — 425 lbs. 750 TT I.S.P. 440 v 3 ph. 60 cy.— Built 1944
1	500	Moore	Non-condensing. 150/200 lbs. I.S.P. 5/25 lbs. G.B.P. 3/60/480 volt Direct Connected Exciter
1	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.— 240/480 v. 3 ph. 60 cy.
1	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Wstn.		2400/4150	300

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6900/13200
1—	2000	G.E.	300	600 25 cy.	11000
1—	1500	G.E.	720	600	12500
1—	1500	G.E.	360	275	2300/4160
1—	1500	G.E.	514	275	6900/13200
1—	1000	G.E.	900	260	4100/6600
1—	1000	G.E.	600	600	2300/4160
1—	1000	Wstn.	900	600	2300/4160
1—	600	Wstn.	940	250	6900/13200
1—	500	Wstn.	1200	125/250	2300
1—	500	Wstn.	720	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	250	G.E.	900	125	4160
1—	250	G.E.	1200	275	2300
1—	150	Wstn.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
2—4250	G.E.	BVDDJ		6600/4160
1—1150	A.C.	OISC		13200x480 2400
1—1000	G.E.	HVDDJ	1	2300x480
1— 300	G.E.	HT	3	24000x2340/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

GM SERIES 71

DIESEL PARTS

W.R. B

LINER KITS — LINERS
PISTONS — RINGS —
PINS MAIN and CONN.
BEARINGS — EXHAUST
VALVES INSERTS—GAS-
KET SETS LO and FO
ELEMENTS.

Prices on Request

LACKBURN & CO.
149H BROADWAY
NEW YORK 6, N. Y.

—TRANSFORMERS—

BOUGHT AND SOLD

We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

ELECTRIC CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular supplier.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
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TURBO GENERATOR

Available Immediately
7500 KW G.E. Co.
180 P.S.I.—525°F Total Temp.
3 phase 60 cycle 2300 volt
With Surface Condenser
GOOD CONDITION

Union Electric Co. of Missouri
315 N. 12th Blvd. St. Louis 1, Mo.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4160V., 2300V Pyrenol
1—1500 KVA Penn. 3 ph., 4150V. Y 2400V Delta
2— 400 KVA Pitts., 1 Ph., 2400/4800V pri. 240/480V sec.
1— 200 KVA G.E., 3 Ph., 2400-220 Sec.
3— 100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
6— 50 KVA G.E., 1 Ph., 13,440V., 120/240 Sec.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach. 720 RPM. 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1000 RPM., 220V.
2— 150 H.P., Al. Chal. 360 RPM., 440V.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM. 4000V Sc.
1— 200 KW Wstn., 275V. 900 R.P.M., 220 V Syn.
1— 175 KVA West., 1Ph., 2200V. Meter 3Ph., 440V
1— 150 KW. G.E., 125/250V. 1200 RPM, 2300 Syn
1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.
1— 75 KW C.W. 250V. 1200 RPM. 2300/3150V Syn.

SLIP RING MOTORS

1— 200 H.P., West. CW. 600 RPM, 440V.
1— 250 HP West., CW. 600 RPM, 440V.

SYNCHRONOUS CONDENSER

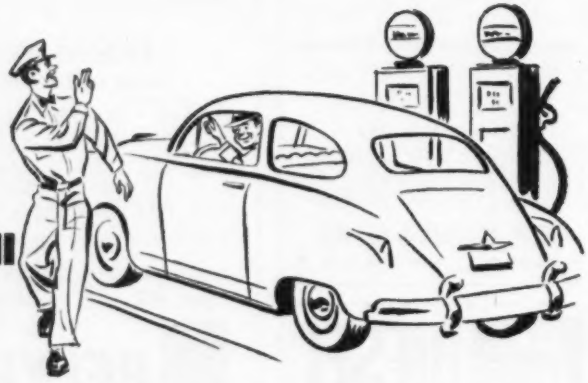
1— 200 H.P. West. CW., 600 RPM, 440V.
1—2500 KVA Wstn., 720 RPM, 2300V with DCEXC.

Large Stock of A.C. and D.C. Equipment

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"



Nobody knows for sure how it started—this line about "See you at the Polls!" we're hearing all over these days.

Best explanation seems to be that it came from that state candidate out west. . . . His opponent in a debate got all riled up and challenged him to fight it out in the alley.

But he said—"I'll settle this the AMERICAN way—I'll see you at the polls!" And the audience picked up the chant.

Now everybody's saying it—and on Nov. 4 everybody will be *doing* it!

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

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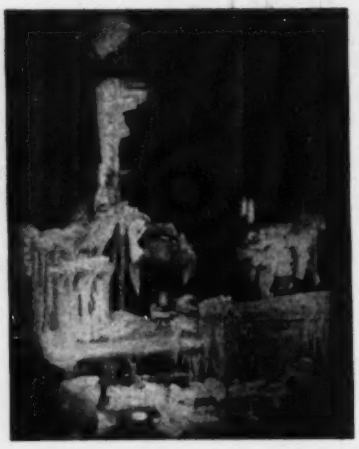
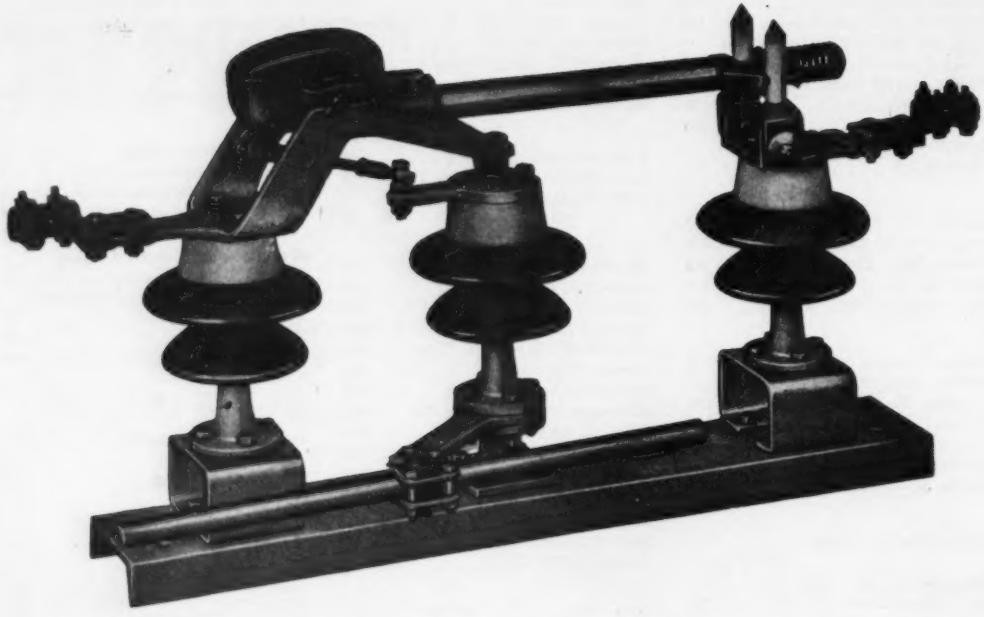
Cole Electric Co.

9433 Steller Drive TExas 8-4701 Culver City, Calif.

Tests made in our laboratory under severe icing conditions show the switch illustrated below, closed (left) and after opening (right). Ice was over 1" thick: Only 450 inch pounds were required to open switch.

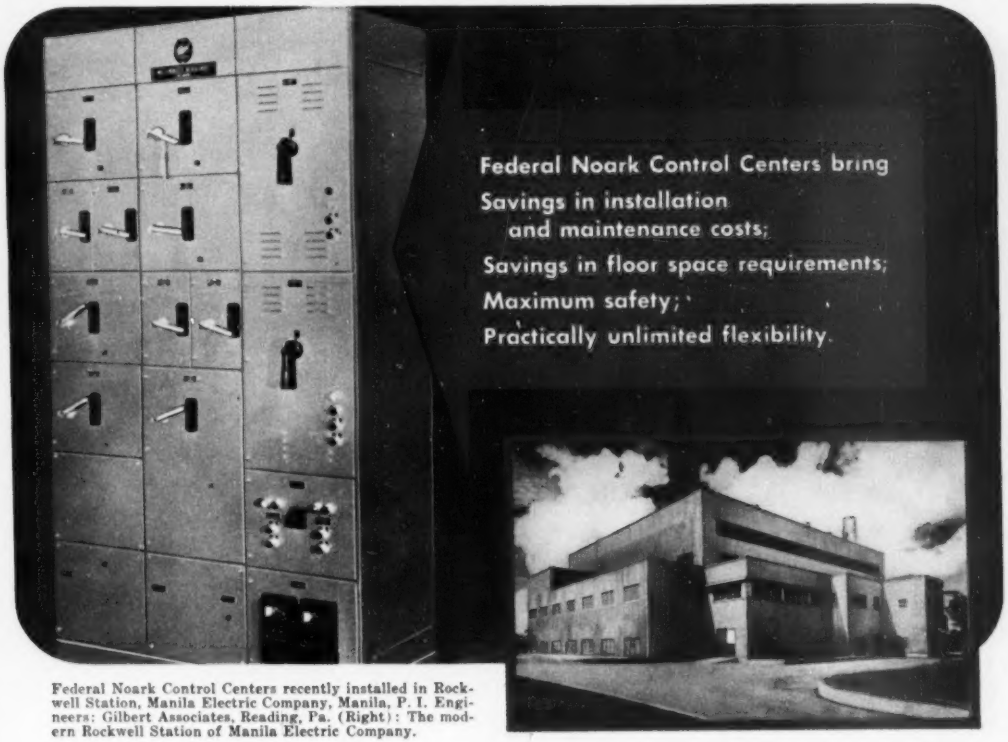




AIR BREAK DISCONNECTING SWITCH
15,000 Volts, 600 Amperes, Type 0-2
Vertical Break, Three Pole, Single Throw, Group Operated
SILVER TO SILVER CONTACTS

GET TOP EFFICIENCY, ECONOMY, SAFETY...WITH

FEDERAL NOARK® CONTROL CENTERS



Federal Noark Control Centers recently installed in Rockwell Station, Manila Electric Company, Manila, P. I. Engineers: Gilbert Associates, Reading, Pa. (Right): The modern Rockwell Station of Manila Electric Company.

Federal Noark Control Centers are today's top choice because they are designed to meet your requirements completely. They are easy to buy and install. From then on, they're the easiest to service... the easiest to expand and rearrange... the easiest to relocate, if that becomes necessary.

Federal Noark Control Centers give you:

★Plug-in starter units that eliminate working "hot" connections.

★Buses and starter contacts silver plated to insure long life and trouble-free contact.

★Guide rails position the starter units for exact contact alignment.

★Starters, size 1 to 4, designed in multiples of a fixed dimension to afford maximum flexibility.

★One size vertical section for both front and back-to-back mounting.

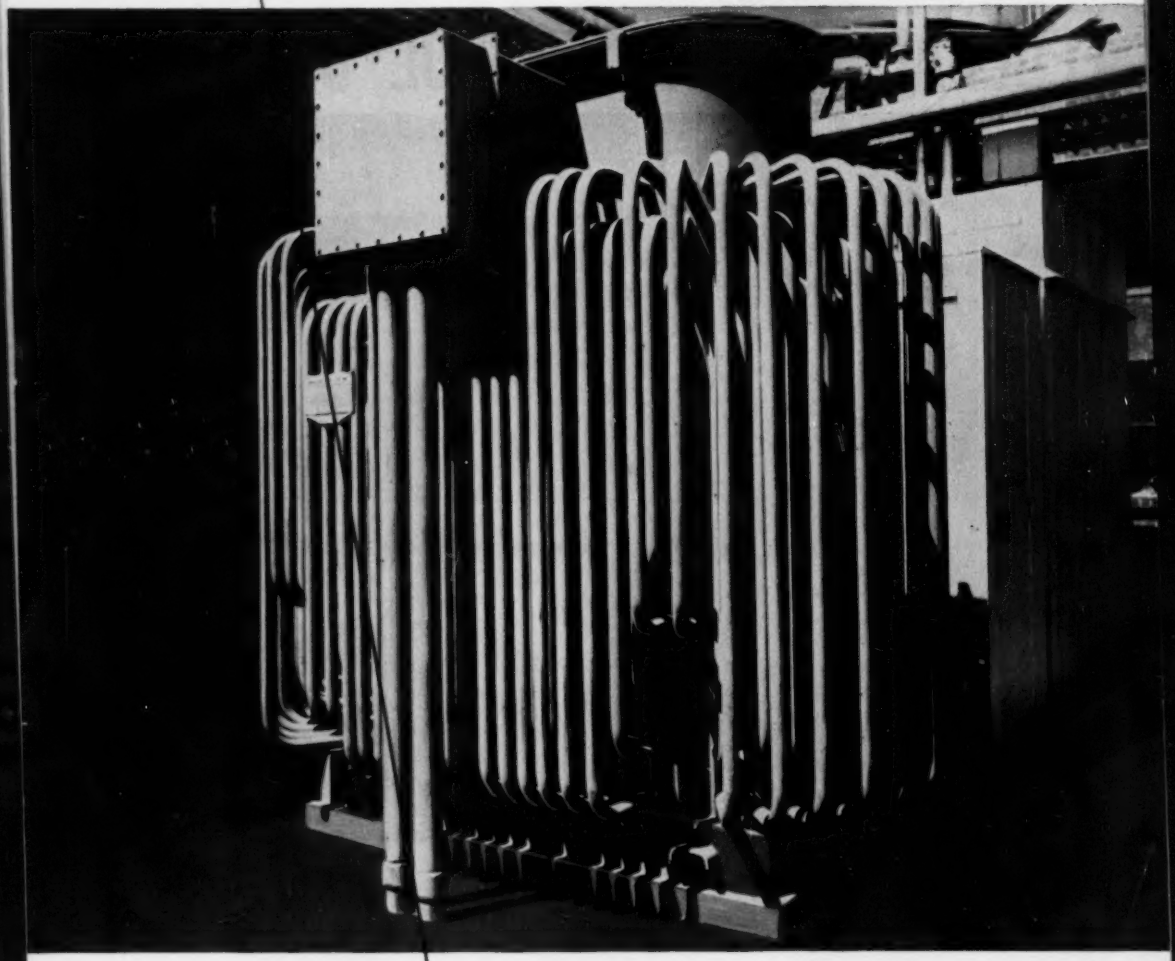
For today's best in engineering and dollar value, specify Federal Noark Control Centers. Write for full data and range of sizes.

Federal Electric Products Company, 50 Paris Street, Newark 5, New Jersey.

FEDERAL NOARK

Federal Noark products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

MORE POWER FOR CALIFORNIA INDUSTRY



Many industries economize by installing transformers like this Kuhlman 2000 KVA 3 phase, Saf-T-Kuhl transformer, rated at 24 KV, located at Fibreboard Products Inc., Antioch, California.

Because Saf-T-Kuhls contain a cooling fluid which is 100% safe from the danger of fire or explosion, this firm was saved the expense of building a fireproof vault. And, because the fluid does not sludge, it does not have to be filtered or reconditioned — an additional saving.

Saf-T-Kuhls, like all Kuhlman transformers, are expertly engineered and solidly built. Kuhlman has been building transformers that way since 1894.

Why not specify Kuhlman for your next installation? Write for complete details. For more information about Saf-T-Kuhls ask for bulletin CS-501.

Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

The complete Kuhlman line includes Distribution, Dry Type, Power, Saf-T-Kuhl, and specialty units.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,*
67 Broad Street, New York 4, N.Y. Cable Address, Microphone, N.Y.